THE IMPACT OF MEDICAID ON CHILDREN'S HEALTH SERVICE USE AND EXPENDITURES: 1987 NATIONAL MEDICAL EXPENDITURE SURVEY

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EXECUTIVE SUMMARY

This report is part of a larger project funded by the Health Care Financing Administration (HCFA) to study the impact of the Omnibus Budget Reconciliation Act of 1989 (OBRA-89) on the Early, Periodic Screening, Diagnosis and Treatment (EPSDT) programs in four States - California, Georgia, Michigan, and Tennessee - and on the health status, service use, and expenditures of Medicaid children. The project has four major components: (1) case studies of the four States to determine how they operate their EPSDT programs and how program policies changed as a result of the OBRA-89 legislation; (2) claims data analysis of children's Medicaid utilization and expenditures in the four States in 1989 and 1992 (the first year in which the OBRA-89 provisions were fully implemented); (3) a study of the supply of child health providers participating in Medicaid and EPSDT in the four States in 1989 and 1992 also using the claims data; and (4) an analysis of national survey data to determine how the health status, service use, and expenditures of Medicaid children differed from those of other children in the United States both prior to and following OBRA-89.

This report presents the results of several analyses of the 1987 National Medical Expenditure Survey (NMES) Household Survey data that were used to determine the generalizability of findings from the four-State Medicaid Tape-to-Tape (TTT) claims data analyses and to provide a national context within which to interpret the claims data findings. These analyses include: (1) an analysis of preventive care visits made by Medicaid children compared to privately insured and uninsured children in the United States; (2) an analysis of the settings of care for different types of outpatient visits among children by source of payment; and (3) an analysis of total health care expenditures for children by level of care and health insurance coverage.

In the first analysis, we found that the participation and visit rates computed with Medicaid-covered preventive care visits from the 1987 NMES data fell within the range of rates computed with the 1989 claims data for the four TTT States. In addition, we found that while the majority of preventive care visits among children enrolled in Medicaid in 1987 were covered by Medicaid, slightly more than 10 percent were covered by other sources. These findings suggest

that the results from the TTT analyses can be considered representative of children's Medicaid experience in most States and that estimates from these data encompass the majority of these children's preventive care use. However, researchers and policy makers should be aware that measures of annual preventive care use among Medicaid children computed from claims data underestimate these children's total use by a small but significant amount.

We also found that Medicaid coverage removed financial barriers for low-income children who would otherwise have been uninsured. Medicaid children were more likely than uninsured children in 1987 to have had any preventive care visits, and among children with visits, Medicaid children were more likely than uninsured children to have had the AAP-recommended number of visits. However, because of prevailing non-financial barriers in 1987, Medicaid children were less likely than privately insured children in moderate-to-high-income families to have had recommended preventive care visits. Non-financial barriers that led to lower preventive care use rates among Medicaid children compared to children in financially better-off families include low maternal education levels and siblings under six years of age. These factors had differential effects for children under three years of age and children aged three to five years of age.

In the second analysis, we investigated how the settings of care used by Medicaid children differed from those used by other children in the United States for different types of visits - well-child, illness-related, and pregnancy-related visits. We found that, for children with well-child visits, there was no difference between children with only Medicaid-covered visits and children with no Medicaid-covered visits in the average number of visits per child after adjusting for age, but Medicaid children had relatively fewer well-child visits at physicians' offices and relatively more well-child visits at clinics and hospital outpatient departments (OPDs). Similarly, among young women with pregnancy-related visits, we found no difference in the overall average number of visits per woman between Medicaid-covered and other young women, but young women covered by Medicaid had a greater number of visits at hospital OPDs. However, for children with illness-related visits, we not only found fewer office visits per child and a greater percentage of emergency room (ER) visits, we also found Medicaid children with visits had a significantly lower average number of visits per child. These findings are consistent

with the hypothesis that Medicaid children had inadequate access to care in general and office-based care in particular.

Further evidence of inadequate access to office-based care is provided by comparing children's reported usual sources of care and the settings of care they used most often during the year. The settings of care reported and used most frequently by Medicaid children more closely matched those of uninsured children in low-income families than privately insured children or children in higher income families. Medicaid children were less likely to report physicians' offices and more likely to report clinics, hospital OPDs and ERs as their usual sources of care compared to all other groups of children, except uninsured children in low-income families. We also found a greater difference in the percentage of children reporting ERs as a usual source of care and those that used ERs most frequently among Medicaid and other low-income children compared to privately insured children in higher income families. Privately insured children in moderate-to-high income families had the smallest difference (just under six percentage points) while Medicaid and other low-income children had significantly larger differences (ranging from 12 to 19 percentage points).

Medicaid coverage, nevertheless, may improve access to office-based well-child care for children who would otherwise be uninsured. Medicaid children and uninsured children in low-income families had similar distributions over the most frequently used setting for illness-related care, but Medicaid children were more likely to use physicians' offices most often and less likely to use clinics and hospital OPDs most often for well-child care compared to uninsured children in low-income families.

The significant effect of children's health insurance and family income on their settings of care persisted in multivariate analyses holding constant health status and selected enabling and predisposing factors. These analyses also suggested that the discrepancies were attributable more to access factors, such as the hours of operation and location of office-based practices, than to differential care-seeking behaviors.

In the third analyses, we explored whether health care expenditures among Medicaid children differed from privately insured and uninsured children in different level-of-care categories and whether the influence of family characteristics differed in these categories. The different levels of care were: (1) no care, (2) preventive/dental care only, (3) ambulatory illness-related care with or without preventive/dental care, and (4) inpatient care with or without other care. Infants born during the year were examined separately because they all had some inpatient care.

We found that, except for infants, differences in the level of care or expenditures between Medicaid children and privately insured children in moderate-to-high-income families in 1987 were explained by differences in health status and enabling and predisposing factors. Furthermore, uninsured children were significantly less likely to have any health care expenditures and, when they did, they had significantly lower total expenditures than privately insured children in families with moderate-to-high incomes. These findings persisted after controlling for health status and selected enabling and predisposing factors.

On the other hand, Medicaid coverage but not the lack of insurance was a significant, negative determinant of total health care expenditures for infants. Infants from low-income families, regardless of insurance coverage, had lower total expenditures compared to infants from higher income families. Holding health status and other factors constant, low-income infants with private coverage had the lowest total health care expenditures compared to all other children.

Besides the financial barrier variables, the most consistent factors reducing health care use and expenditures among children in 1987 were African-American race/ethnicity, low maternal education, and the presence of siblings under six years of age. Among children with health care expenditures, the regressors in our equations explained a larger portion of the variation in expenditures for preventive/dental care only than the variation in expenditures for illness-related care.

I. INTRODUCTION

This report contains three analyses of the 1987 National Medical Expenditure Survey (NMES) Household Survey data: (1) an analysis of preventive care visits made by Medicaid children compared to privately insured and uninsured children in the United States; (2) an analysis of the settings of care and provider specialties for different types of outpatient visits among children by source of payment; and (3) an analysis of total health care expenditures for children by level of care and health insurance coverage. Each analysis has two main goals: first, to determine the generalizability of findings from the four-State Medicaid Tape-to-Tape (TTT) claims data analysis and, second, to provide a national context within which to interpret the results on Medicaid children.

A. Background

The 1987 NMES Household Survey is a national probability sample of the United States civilian, noninstitutionalized population designed to provide national estimates of health insurance coverage and of the use of and expenses for health services among this population. Because of continuing policy concern with certain populations having restricted access to health care, low-income families and black and Hispanic minorities were oversampled. The sample includes 10,952 persons under 21 years of age for whom a complete set of data was gathered. These children are the subject of the three analyses contained in this report.

The questions examined in these analyses could not be addressed with other data used in the project because the other databases do not contain the requisite data elements. In particular, the 1987 NMES database contains records with detailed information for each ambulatory care visit made by the sample population during the year. These details include sources of payment and the setting of care. In addition, the database includes monthly insurance coverage information, including for each month of the year whether the child was enrolled in Medicaid, had private health insurance, or was uninsured. These data allowed us to duplicate the procedures used with the TTT claims data to compute preventive care participation and visit rates

for a national sample of Medicaid children,[1] to compare the extent to which Medicaid children received preventive care outside the program, and to compare the experience of Medicaid children to that of other children in the United States. Furthermore, we were able to identify children's settings of care for ambulatory preventive care, illness-related care, and pregnancy-related care and to compare these settings of care for children with only Medicaid-covered visits and children with no Medicaid-covered visits.

Finally, none of the other national surveys used in this project contain data on medical expenditures for children not covered by Medicaid. The NMES database contains both aggregate medical expenditures per sample child, as well as expenditures related to each medical contact. Thus, we were able to identify children with only preventive care expenditures, those with illness-related care but no inpatient care, and those with inpatient care. This stratification allowed us to determine how total expenditures differed by whether the child was well, mildly ill, or very ill.

Because the variable specifications and statistical procedures differ in each of the three analyses, a Data and Methods section precede each of the three Results and Conclusions sections. The results are interpreted in light of the goals of provisions in the 1989 Omnibus Budget Reconciliation Act (OBRA-89) related to the Early Periodic Screening, Diagnosis and Treatment (EPSDT) program and other Medicaid-covered services for children. Furthermore, where possible, we compare the results from the NMES data to those found in the TTT claims analyses. This allows us to determine the generalizability of the TTT study results. First, we review other studies of children's health care service use and expenditures from the 1987 NMES.

B. Prior Studies of Children's Health Service Use and Expenditures with NMES

The 1987 NMES database has already been extensively used in analyses of the impact of health insurance on children's health care service use and expenditures. A few of these studies

[1] The TTT analyses are limited to the four States in that database - California, Georgia, Michigan and Tennessee.

are outlined in Table I-1. Most of the studies are cross-sectional; two also include longitudinal analyses comparing data from the 1977 National Medical Care Expenditure Survey (NMCES) with the 1987 NMES data. The studies investigated a variety of health service use and expenditure measures, such as the probability and number of preventive care and illness-related visits, whether a physician was seen for specific childhood illnesses, and hospital expenditures for infants. Most studies compared the experiences of insured and uninsured children. Insured children were typically separated into privately and publicly insured groups, but only three of the nine studies in Table I-1 compared Medicaid children in particular to other groups of children. Another study included only Medicaid children.

In general, these studies indicate that in 1987, children with insurance had greater health care use and expenditures compared to uninsured children. Uninsured children were less likely than insured children to receive both preventive care and care for typical childhood illnesses (Cunningham and Hahn, 1994; Lefkowitz and Monheit, 1991; Lefkowitz and Short, 1989; Monheit and Cunningham, 1992; Short and Lefkowitz, 1992; Stoddard et al., 1994; Vistnes and Hamilton, 1995). In addition, both the number of uninsured children and the disparities in health service use between insured and uninsured children increased from 1977 to 1987 (Monheit and Cunningham, 1992).

Descriptive analyses show that privately insured children had somewhat higher levels of health care utilization than publicly insured children (Lefkowitz and Monheit, 1991; Lefkowitz and Short, 1989; Monheit and Cunningham, 1992). However, after controlling for age, race/ethnicity, health status, and various characteristics of the child's mother and family, including family income, the researchers found little, if any, differences in the levels of utilization between privately and publicly insured children (Cunningham and Hahn, 1994; Short and Lefkowitz, 1992).

In a multivariate analysis of the use of well-child and sick visits, Short and Lefkowitz (1992) found a full-year of Medicaid coverage to be associated with a significant increase in well-child care for low-income children who would otherwise be uninsured. The effect of Medicaid on sick visits was smaller and not statistically significant. They found part-year

TABLE I-1
PREVIOUS STUDIES OF CHILDREN'S HEALTH CARE SERVICE USE AND EXPENDITURES WITH THE 1987 NMES

Citation	Ages	Type	Financial Barrier Variables	Outcome Measures	Findings
Cohen and Cunningham (1993)	0-17 years	Multivariate, cross-sectional	Sample restricted to Medicaid children. • Below the poverty level	• Had any ambulatory physician use • Had preventive office-based visit • Had illness-related office-based visit • No. of office-based preventive visits • No. of illness-related office-based visits • Had usual source of care • Had physician's office as usual source • Ambulatory physician expenditures	Studied impact of Medicaid fee generosity. Found where fees were higher, Medicaid children were more likely to have a physician's office as a usual source of care and to have a greater number of office-based preventive visits.
Cunningham and Hahn (1994)	0-5 years and 6-17 years	Multivariate, cross-sectional	Uninsured • Part year • All year Insured • Private • Public	• Had any preventive care • Number of preventive care visits • Had any illness-related care • Number of illness-related visits	Examined implications of family structure. Found that young children in mother-headed families had a lower probability of any use than those in two-parent families regardless of health insurance coverage and that the impact of health insurance is greater among mother-headed families than two-parent families.
Lefkowitz and Monheit (1991)	0-5 years and 6-17 years	Descriptive, cross-sectional	• Any private insurance • Public insurance only • Uninsured all year	• % with any health services • Total health care expenditures • Out-of-pocket health care expenditures • Proportion spent out-of-pocket	Found the probability of use higher among privately insured children than publicly insured children, who in turn had a higher probability of use than uninsured children; among young children, publicly insured had the highest total and the lowest out-of-pocket expenditures while the uninsured had the lowest total and highest out-of-pocket expenditures; and among older children, privately insured had highest total and out-of-pocket expenditures.
Lefkowitz and Short (1989)	0-2 years	Descriptive, cross-sectional	Family income < 200% FPL • Ever privately insured • Ever on Medicaid • Uninsured all year	• % with well-child visits by no. of visits • % with immunization by vaccine type	Medicaid children were less likely than privately insured children in general and as likely as uninsured children to have had any well child visits, to have been in compliance with the AAP guidelines, and to have had DPT and polio immunizations. However, low-income, privately insured children had similar well-child care use as Medicaid children.

TABLE I-1 (continued)

Citation	Ages	Type	Financial Barrier Variables	Outcome Measures	Findings
Lewit and Monheit (1992)	0-18 years	Descriptive, cross-sectional and longitudinal	Source of payment • Out-of-pocket • Private insurance • Other private • Medicaid • Other public	• Ambulatory physician expenditures • Inpatient physician expenditures • Inpatient hospital expenditures • Ambulatory hospital expenditures • Nonphysician ambulatory expenses • Prescription drugs expenditures • Dental expenditures • Other expenditures	Found that expenditures for children are relatively low and have declined over time (1977-1987) compared with expenditures on adults; that the government picked up a lower percentage of total health care expenses for children compared to adults with 13-18 year olds with the lowest percentage; and that he greatest increase in expenditures for children over time was in hospital care among children aged 0-2.
Monheit and Cunningham (1992)	0-18 years	Descriptive, cross-sectional and longitudinal	• Privately insured all year • Publicly insured all year • Uninsured part year • Uninsured all year	• % with usual source • % with any and no. per user of: -Ambulatory care contacts -Physician contacts -Non-physician contacts -Prescription drugs -Dental care	Found that children were more likely to be uninsured in 1987 than 1977; that in both years, uninsured children were at a disadvantage in their use of health services relative to insured children; and that over time, disparities in health service use between insured and uninsured children increased.
Short and Lefkowitz (1992)	0-4 years	Descriptive, cross-sectional Multivariate, cross-sectional	Family income < 200% FPL • Uninsured • Private full year • Private part year • Medicaid full year • Medicaid part year • Income/poverty ratio • Private full year • Private part year • Medicaid full year • Medicaid part year	• % any visits • % well-child visits • compliance with AAP • Had any well-child visits • In compliance with AAP standards • Had any sick visits • No. of sick visits	A full year of Medicaid coverage is associated with a significant increase in well-child care for low-income children who would otherwise be uninsured. The effect of Medicaid eligibility on sick visits is somewhat smaller and not statistically significant. Part-year Medicaid coverage has no significant effect on the use of ambulatory care.
Stoddard et al. (1994)	1-17 years	Multivariate, cross-sectional	• Insured • Uninsured	Whether or not a physician was seen by children with • Pharyngitis • Acute earaches • Recurrent ear infections • Asthma	Uninsured children were less likely than insured children to receive medical attention from a physician for all four conditions and therefore may be at increased risk of avoidable morbidity.
Vistnes and Hamilton (1995)	0-15 years	Multivariate, cross-sectional	Details of insurance coverage for outpatient physician services and well-child care, respectively, including: • Had coverage • Deductible • Coinsurance	• Number of well-child visits • Number of other ambulatory visits	Examined impact of mother's time costs on children's health service use. Found higher time value, increased weeks worked per year, and hours worked per week all reduced the number of sick visits. The mother's education, the child's age, and recommended guidelines were more important in determining well-child visits than time or monetary costs.

Medicaid coverage to have no significant effect on the use of ambulatory care. Along with other researchers, Short and Lefkowitz also found characteristics such as family structure, mothers' time costs, and the mothers' level of education to be at least as important as Medicaid or other insurance in determining health care utilization levels (Cunningham and Hahn, 1994; Short and Lefkowitz, 1992; Vistnes and Hamilton, 1995).

Finally, Cohen and Cunningham (1993) studied the impact of physician fee generosity on Medicaid children's access to and utilization of ambulatory care with event-level data from the 1987 NMES. They found that while fee levels were not associated with whether Medicaid children had a usual source of care or the probability of ambulatory visits in general, they were significantly related to the usual source of care site and the number of preventive care visits made to office-based physicians. Where fee levels were higher, Medicaid children were more likely to have a physician's office as a usual source of care and to have a greater number of office-based preventive care visits. However, the magnitudes of these effects were small - a 10 percent increase in fees increased the use of office-based physicians as a usual source of care by 3 percent and the number of preventive visits made at office-based sites by 5 percent. In addition, they found that having an office-based physician as a usual source of care was associated with lower total ambulatory physician expenditures.

These prior studies addressed many of the questions relevant to our study of the impact of the OBRA-89 provisions on Medicaid children's use of preventive and curative services. However, many other questions important for determining the generalizability of the claims data analyses were not addressed. In this paper, we focused on these additional questions, thereby extending rather than replicating the earlier analyses.

II. PREVENTIVE CARE USE AMONG MEDICAID AND OTHER CHILDREN IN THE UNITED STATES

OBRA-89 required States to set up distinct periodicity schedules for EPSDT screening visits and established Federal authority to set state-specific performance standards for EPSDT. The Secretary of the Department of Health and Human Services subsequently directed all States to increase participation in EPSDT to 80 percent of Medicaid-enrolled children by fiscal year 1995. In an earlier report, we presented an analysis of EPSDT participation and the frequency of Medicaid-covered preventive care visits made by children enrolled in the program in the four TTT States using the 1989 claims files (Herz et al., 1994). These figures provide baseline rates for an analysis of the impact of these OBRA-89 provisions. In a subsequent report, we compare the 1989 EPSDT participation and preventive care visit rates with similar rates computed from the 1992 claims files (Herz et al., 1996).

We found that, through the EPSDT program in 1989, these States were reaching only 40 percent of Medicaid children expected to have well-child visits - half the target rate. The results were not much better when we considered both EPSDT screening visits and other well-child visits paid through the Medicaid program; half or fewer Medicaid children expected to have visits had received any well-child care through Medicaid, and only 30 to 46 percent of recommended visits were received. In addition, despite the legislated service enhancements and focus on screening visits, there was only a slight improvement in well-child visit rates from 1989 to 1992. We found an average increase of 2 percentage points in the percentage of children with any preventive care visits, and an average increase of 6.5 percentage points in the percentage of recommended well-child visits that were made among Medicaid children. However, this period also saw a large increase in the number of children enrolled in Medicaid. If the program expansions reached newly enrolled children who would have gone without recommended well-child care in the absence of Medicaid coverage, even a small improvement in the percentage of Medicaid children screened could represent a significant increase in the percentage of children in the United States receiving well-child care.

To investigate these results further and to determine their generalizability, we applied the procedures developed for the claims data to the monthly Medicaid eligibility and event-level ambulatory care visit data for the sample of children in the 1987 NMES household survey. With these data, we were able to investigate four additional questions related to children's preventive care use that could not be addressed with the Medicaid claims data:

- Are well-child visit rates for a nationally representative sample of Medicaid children similar to those found for Medicaid children in the four TTT States?

- To what extent did children enrolled in Medicaid any time during 1987 utilize preventive care outside of the Medicaid program?

- Did Medicaid children utilize preventive care at different rates than privately insured and uninsured children in the United States?

- What was the relative importance of selected demographic and socioeconomic characteristics in determining the probability and frequency of preventive care visits among preschool-aged children?

A. Data and Methods

We computed preventive care participation and visit rates* with data on all children from the 1987 NMES. For Medicaid children, we computed two sets of rates. The first set included only preventive care visits paid for through the Medicaid program and were adjusted for the child's Medicaid enrollment period. These rates are compared with those computed from the TTT data. The second set counted all preventive care visits made by Medicaid children during the year, regardless of payment source. By comparing the two sets of rates for Medicaid children, we examined the extent to which they had preventive care visits outside of the program. In addition, the latter rates are compared with rates we computed from the NMES data for children with some private insurance coverage during the year and children who were uninsured during the entire year. Medicaid children are broken out by whether they had other health

* See Appendix.

insurance during the year and privately insured and uninsured children are broken out by whether their families had incomes above or below 200 percent of the Federal poverty level (FPL). We based all rates on the American Academy of Pediatrics (AAP) recommended schedule of well-child visits.

To investigate important covariates of preventive care use, we performed both descriptive and multivariate analyses of the participation and visit rates. In the descriptive analyses, the rates were calculated by Medicaid eligibility group and health insurance and income category and further by age group, gender, race/ethnicity, and the metropolitan designation of the child's county of residence. These categorizations were chosen to allow comparisons to the rates computed from the 1989 and 1992 TTT data (Herz et al., 1994; Herz et al., 1996). To determine the relative impact of these and other demographic and socioeconomic characteristics of the child and the child's family, we ran multivariate regressions on the participation rates for children under six years of age - for whom at least one visit during the year was recommended - and on the visit rates for children under three years of age - for whom more than one visit was recommended. These regressions also allowed us to determine the impact of Medicaid coverage on the receipt of preventive care, holding constant these other influences.

The results of the multivariate analyses will be compared to multivariate analyses of the 1989 and 1992 participation and visit rates from the TTT data. The methods used to compute certain variables and to draw the subsample of children for the descriptive and multivariate analyses are described below.

1. Insurance and Medicaid Eligibility Categories

For the descriptive analyses, we classified children as covered by Medicaid if they were enrolled in the program during any month of 1987, regardless of any other insurance coverage they may have had. We were able to further classify Medicaid children into one of three eligibility categories - AFDC cash assistance recipients, SSI cash assistance recipients, and all other Medicaid children. The latter category includes children categorically eligible for AFDC but not receiving cash payments, Ribicoff children, the medically needy, and children eligible

under the poverty-related expansions, which were implemented in a few States that year. Children who were not reported to have Medicaid coverage during any month of 1987 but who had at least one month of private insurance coverage we designated as privately insured.[2] Finally, we classified children who were uninsured for the entire year as uninsured.

2. Preventive Care Visits

We defined preventive care visits as all ambulatory visits for general check-ups, well-child care, or immunizations, regardless of site of care (e.g., hospital outpatient department, neighborhood clinic, and physicians' office). General check-ups for pregnancy-related conditions were excluded for this analysis. We used the source-of-payment variable to distinguish Medicaid-covered visits from all others. The procedures used to compute participation and visit rates are described in the Appendix.

The AAP recommended periodicity schedule for preventive pediatric health care was used to compute the participation and visit rates (AAP, 1988). In 1987, the AAP recommended that a child have 20 preventive care visits throughout his/her childhood: six visits by the child's first birthday at one, two, four, six, nine and 12 months of age; three visits in his/her second year of life at 15, 18 and 24 months of age; one visit a year through age six; and one visit every other year thereafter.[3]

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[2] This category also includes a small number of children with other public coverage, such as CHAMPUS.

[3] Unfortunately, the NMES public use file does not provide children's dates of birth, which we needed to determine the expected number of preventive care visits during the year for children under three years of age. However, we were able to determine dates of birth for infants by linking to their delivery hospital records. Thus, for children 12 months and under, we were able to compute age in months and child-specific expected numbers of well-child visits. However, for children aged 13 months through 36 months, we had to estimate the expected number of visits. We assumed 4.5 and 2.0 visits for children recorded as one and two years of age, respectively, and one visit a year for children aged three through six years.

3. Selection of Children for the Multivariate Analysis

We restricted the multivariate analyses to children in age groups that were expected to have at least one preventive care visit during the year- i.e., children under six years of age. In addition, because substantial positive correlations in the error terms among family members can result in inefficient estimates of the coefficients and inconsistent estimates of the standard errors, we randomly selected a single child under age six from each NMES household with children under six. We adjusted the sample weight of the chosen child's record to reflect the probability of selection by multiplying the child's core weight by the number of children under six years of age in the household. For example, in a household with three children under six, the sample child had a one in three probability of selection. Therefore, that child's weight was multiplied by three. Because a sample selected in this manner will be younger on average than if all children under six in the family were included, we also performed a post-stratification adjustment of the sample weights by age, race, and gender to make the distribution of sample children match that of all children in the original NMES sample.

In Table II-1, we show the percentage distributions over major demographic and socioeconomic characteristics of all children under 21 years of age, all children under age six, and the sample of children under six used in the multivariate regressions. Compared to children of all ages in 1987, children under six years of age were slightly more likely to come from low-income families and to have Medicaid coverage, and their mothers' were more likely to be married and unemployed. There were no differences in the distributions over the demographic and socioeconomic variables between all NMES children under six years of age and the sample with one child under age six per household.

4. Specification of the Multivariate Regression Models

Short and Lefkowitz (1992) performed multivariate logistic regressions of the probability of any preventive care visits and compliance with the AAP periodicity schedule using data from the 1987 NMES on children under five years of age in low-income families. They measured compliance with a dichotomous variable for whether the child had the recommended number of

TABLE II-1
PERCENTAGE DISTRIBUTION OF WEIGHTED COUNTS OF CHILDREN BY DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS, 1987 NMES

	All Children Under 21 Years	All Children Under 6 Years	One Child Under 6 Per Household
Unweighted count	12,223	3,643	2,596
Weighted count (1000s)	58,096	22,133	22,251
Age			
< 1 year	5.2	17.5	17.5
1-2 years	9.7	32.3	32.3
3-6 years	19.9	50.2	50.3
7-12 years	27.4	--	--
13-20 years	37.8	--	--
Gender			
Male	50.7	51.1	51.1
Female	49.3	48.9	48.9
Race/Ethnicity			
Hispanic	10.5	11.6	11.5
Black non-Hispanic	15.0	13.8	13.8
Other	74.6	74.7	74.7
Family Income			
Low income (< 200% of the FPL)	40.5	44.7	44.3
Middle to high income	59.5	55.3	55.7
Insurance Coverage			
Uninsured all year	10.9	7.8	7.7
Medicaid coverage	15.4	20.7	21.1
Other insurance only	73.7	71.5	71.2
Mother's Marital Status			
Married	70.3	74.8	74.6
Not married	22.8	21.7	21.8
Unknown, no mother in HH	7.0	3.6	3.6
Mother's Employment Status			
Employed	55.7	49.4	49.3
Not employed	37.6	47.3	47.0
Unknown, no mother in HH	6.6	3.2	3.6
Mother's Education			
Less than high school	20.3	20.7	20.9
High school graduate	39.1	39.5	39.3
Some college	33.0	35.0	35.1
Unknown, no mother in HH	7.5	4.7	4.8

TABLE II-1 (continued)

	All Children Under 21 Years	All Children Under 6 Years	One Child Under 6 Per Household
Metropolitan Residence			
Core metropolitan area	24.4	27.4	27.5
Other metropolitan area	49.1	48.0	47.8
Non-metropolitan area	26.6	24.5	24.8
Region			
Northeast	18.5	18.7	18.5
Midwest	25.9	27.2	27.0
South	36.1	33.3	33.6
West	19.5	20.9	20.9

FPL - Federal poverty level

visits given his/her age at the end of the year. However, for children aged three and over, their compliance variable is identical to their variable for whether the child had any visits; similarly, our participation and visit rates are identical for children aged three and over.

Therefore, to estimate the independent effects of the factors of interest on the probability of any visits and compliance with AAP guidelines, we ran three separate regressions. First, for children two years of age and under, for whom more than a single visit a year is recommended, we ran a logistic regression of the probability of any preventive care visits during the year, using the participation rate as the dependent variable.[4] Then, for children two years of age and under with some preventive care, we ran an ordinary least squares (OLS) regression on the visit rate. Finally, because children aged three through five years are only expected to have one visit per year, we ran a single multivariate logistic regression on their participation rate.

There are several other differences between our regression equations and those of Short and Lefkowitz (1992). Because the public use file we used did not have identifiers for linking information on the child's area of residence, we were not able to control for physician supply. In addition, our file did not contain a variable indicating whether the child was a first-born child in his/her family. As a proxy, we included the number of children under six years of age living in the household. We also divided the metropolitan area designation into core metropolitan and other metropolitan, whereas Short and Lefkowitz had a single metropolitan identifier, and we dropped cases with unknown values on any of the independent variables, whereas Short and Lefkowitz kept those whose perceived general health status or mothers' education level was unknown.[5] Furthermore, instead of the part-year and full-year Medicaid and private insurance variables used by Short and Lefkowitz, we used the mutually exclusive health insurance and income categories from our descriptive analyses. This specification allows comparisons with data from other files used in this study.

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[4] The child-level participation rate variable is a dichotomous variable with a value of zero if no preventive care visits were made and a value of one if one or more visits were made.

[5] Unlike Short and Lefkowitz (1992), we added a category for infants to the perceived general health status variable; this information was not collected for infants.

Similar to Short and Lefkowitz, we merged several variables on characteristics of the children's mothers onto the children's records and used them as independent variables in the regressions. These variables include the mother's education level, marital and employment status, whether she was less than 21 years of age, and whether the mother lives with her mother. Mothers were present in the household for over 97 percent of the children in the NMES sample. For children not living with their mothers, characteristics of their fathers or other guardians were used in place of their mothers' characteristics. Also like Short and Lefkowitz, we ran a separate regression for children in low-income families.

B. Results of the Descriptive Analysis

The descriptive analysis of the preventive care participation and visits rates addressed all four of the research questions. To answer these questions, we first reviewed levels of preventive care use by children within the Medicaid program, comparing the rates computed with the NMES data to those computed with the TTT data. We then investigated preventive care use among Medicaid children who were covered by other sources, recomputing the rates based on all visits regardless of payment source. These participation and visit rates were then compared to the rates for children with private insurance and children with no insurance. Finally, for children in these three insurance groups, we compared the participation and visit rates by age group, gender, race/ethnicity, and the metropolitan designation of the child's county of residence and tested for statistically significant differences in the rates over these stratifications.[6]

1. Medicaid Children's Preventive Care Participation and Visit Rates with Medicaid-Covered Visits Only

As shown in Table II-2, the Medicaid program reached 43 percent of children recommended by the AAP to have a well-child visit during their period of Medicaid enrollment in 1987. The 43 percent participation rate falls within the 41-51 percent range of participation

[6] To test for statistically significant differences, we used t-tests with standard errors computed in SUDAAN.

TABLE II-2

OVERALL PREVENTIVE CARE PARTICIPATION AND VISIT RATES BY MEDICAID ENROLLMENT CATEGORY, 1987

Medicaid Enrollment Category	Participation Rates		Number of Visits Per User	Visit Rate[1]
	Unadjusted	Adjusted[1]		
Medicaid covered visits during period of enrollment				
Medicaid AFDC recipients	26.9%	43.3%	1.7	46.5%
Medicaid SSI recipients	17.0	30.4	1.4	36.4
Other Medicaid enrollees	24.7	43.6	1.7	44.1
All Medicaid children	27.4	43.0	1.7	45.5
All well-child visits				
Medicaid AFDC recipients	34.9	47.5	1.7	50.4
Medicaid SSI recipients	21.0	34.1	1.5	45.1
Other Medicaid enrollees	34.2	46.2	2.1	52.0
All Medicaid children	34.1	46.7	1.8	51.0

SOURCE: 1987 National Medical Expenditure Survey

[1]Adjusted for the age-specific AAP periodicity schedule.

rates for all well-child visits computed from the 1989 TTT data. Also similar to the TTT findings, the NMES data show SSI recipients to have a lower participation rate than other Medicaid children. The 30 percent participation rate for SSI recipients in NMES falls midway between the 26 to 34 percent range found for SSI recipients in the four TTT States. Whether SSI recipients received less preventive care than other Medicaid children or whether they were more likely to receive preventive care through illness-related visits cannot be determined from the NMES data.

Table II-2 also indicates that the Medicaid program provided almost 46 percent of the AAP-recommended visits. This rate is on the upper end of the visit rate range of 30 to 46 percent found with the TTT data. SSI recipients in the NMES file had a lower visit rate than the other eligibility groups, but the 36 percent rate was again at the high end of the range of rates for the blind and disabled found in the four TTT States.

In contrast to the rates computed from the TTT data, the overall visit rate computed from the NMES data is slightly higher than the overall participation rate. The different trends in the rates may be due to different sources of information on the reason for physician visits in the two databases. Respondents and/or their mothers providing the reason for visits in the NMES data set are likely to report the initial reason for a visit in the survey rather than any minor conditions found or procedures performed during the visit. However, in the claims data, if a physician records a diagnosis code for treatment of a condition found during a well-child check-up and the visit is billed as a regular office visit, the visit claim will be classified as a diagnostic and/or treatment visit under the algorithm we used to distinguish the two types of visits.

2. Medicaid Children's Participation and Visit Rates Including Visits Made Outside of the Program

The figures in Table II-2 further show that while children enrolled in Medicaid had most of their preventive care through the program, they also had a substantial amount outside of the program. When all preventive care visits received by Medicaid children during the year are considered, we find a participation rate of approximately 47 percent - almost 4 percentage points

higher than the rate from Medicaid- covered visits only. Similarly, the visit rate increased from 45.5 percent to 51 percent. Thus, more than 10 percent of all preventive care visits made by children enrolled in Medicaid in 1987 were outside of the program - i.e., not covered by Medicaid.

SSI cash assistance recipients and non-cash assistance eligibles were somewhat more likely to have had preventive care visits outside of the program than were AFDC cash assistance recipients. Nevertheless, SSI recipients had the lowest overall participation and visit rates among the different eligibility groups.

3. Comparison of Preventive Care: Medicaid, Privately Insured and Uninsured Children

In Table II-3, we show the participation and visit rates for children by health insurance and income category. These data reveal that Medicaid children were more likely than privately insured children in low-income families and less likely than privately insured children in higher income families to have had any preventive care visits during 1987 and to have had the AAP-recommended number of visits. Medicaid children were also more likely to have had preventive care visits compared to uninsured children, regardless of family income. All differences were statistically significant ($p \leq 0.01$), except for those between children with Medicaid alone and privately insured children in low-income families. However, children with both Medicaid and private insurance during the year were significantly more likely than low-income children with only private insurance coverage to have had recommended preventive care visits.

Visit rates were slightly higher than participation rates for children in each health insurance and income group. Medicaid children had slightly more visits per child, but this is due to a greater number of younger children among the Medicaid group. Participation and visit rates by age group are shown and discussed below.

TABLE II- 3

OVERALL PREVENTIVE CARE PARTICIPATION AND VISIT RATE BY HEALTH INSURANCE AND INCOME CATEGORY, 1987

Insurance Category	Participation Rates		Number of Visits Per User	Visit Rate[1]
	Unadjusted	Adjusted[1]		
Medicaid children (enrolled at least part of the year)				
Only	33.8	45.8	1.8	49.8
And other insurance	35.7	50.2	2.1	55.3
Children with some private coverage at least part of the year				
In families with incomes < 200% FPL	27.2	39.7	1.6	42.7
In families with incomes ≥ 200% FPL	36.0	53.9	1.8	61.7
Children uninsured all year				
In families with incomes < 200% FPL	18.8	28.6	1.8	34.2
In families with incomes ≥ 200% FPL	21.0	32.6	1.6	33.4
All children	32.4	47.6	1.8	53.7

SOURCE: 1987 National Medical Expenditure Survey

[1]Adjusted for the age-specific AAP periodicity schedule.

4. Variations in Participation and Visit Rates by Age Group

The distribution of children over the age categories varies for Medicaid children compared to the other groups of children (Table II-4). In particular, we find a greater proportion of Medicaid children in the three youngest age groups compared to either privately insured or uninsured children.[7] Approximately 47 percent of Medicaid children in the 1987 NMES file are under seven years of age - the same approximate percentage as found in the TTT data. In contrast, only 34 percent of privately insured and uninsured children in NMES were under seven. These differences in the age distribution highlight the need for age adjustments in computing preventive care participation and visit rates for comparisons across children in different health insurance categories.

As shown in Figure II-1, participation declined by age group for children in the 1987 NMES.[8] Among the NMES children, infants had the highest adjusted participation rates followed by one-to-two-year-olds after which the rates leveled off. The same pattern was evident among Medicaid children, children with private insurance, and uninsured children.

Adjusted visit rates, shown in Figure II-2, exhibit a similar declining pattern only for uninsured children. The adjusted visit rates for one-to-two-year-old Medicaid children were lower than the rates for Medicaid children in other age groups; children aged seven to 12 years had the highest adjusted rate among Medicaid children. The latter result may be due to children covered by Medicaid catching up on well-child visits for immunizations that were missed when they were younger.

Among children with private health insurance coverage, visit rates were approximately the same for all age groups, except infants. Privately insured infants had a substantially higher visit rate than other privately insured children.

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[7] Privately insured and uninsured children were not further broken out by income group because of the small number of children in some of the cells.

[8] The pattern of declining preventive care use by age group was more consistent in the participation and visits rates estimated with the 1987 NMES data than those estimated with the 1989 Medicaid TTT claims data.

TABLE II-4

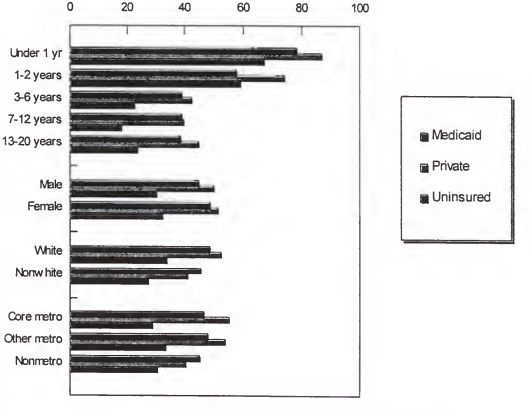
PERCENTAGE DISTRIBUTION OF CHILDREN BY SELECTED DEMOGRAPHIC CHARACTERISTICS, 1987 NMES

	Medicaid Children	Children with Some Private Coverage	Uninsured Children	All Children Under 21 Years
Unweighted count	1,619	5,632	1,095	8,541
Weighted count (1000s)	8,824	41,143	6,870	58,096
Age				
< 1 year	9.4%	5.9%	6.2%	6.7%
1-2 years	11.5	9.2	9.7	9.7
3-6 years	25.6	19.3	17.7	19.9
7-12 years	26.8	28.2	26.1	27.7
13-20 years	26.7	37.4	40.4	36.0
Gender				
Male	49.7%	51.2%	50.5%	50.7%
Female	50.3	48.8	49.5	49.3
Race/Ethnicity				
White	41.3%	84.9%	60.9%	75.2%
Nonwhite	58.7	15.1	39.1	24.8
Metropolitan Residence				
Core metropolitan area	34.8%	21.6%	22.1%	23.4%
Other metropolitan area	38.9	52.8	44.3	49.7
Non-metropolitan area	26.3	25.6	33.6	26.9

SOURCE: 1987 National Medical Expenditure Survey

Figure II-1: Adjusted Participation Rates

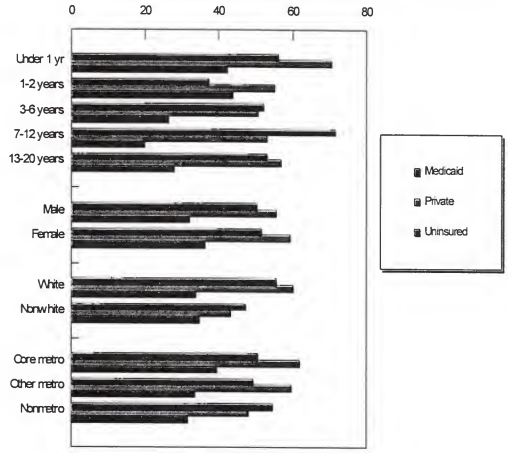
by Insurance Category and Various Demographic Characteristics



SOURCE: 1987 National Medical Expenditure Survey

Figure II-2: Adjusted Visit Rates

by Insurance Category and Various Demographic Characteristics



SOURCE: 1987 National Medical Expenditure Survey

Similar to the findings for Medicaid children in the four TTT States, visit rates computed from the NMES data for children under three years of age, regardless of insurance coverage, were lower than participation rates while for older children, visit rates consistently exceeded participation rates. Thus, not all infants and toddlers received their full series of AAP-recommended well-child visits in 1987 while some older children with well-child visits had more than the single recommended visit for this age group.

5. Variations in Participation and Visit Rates by Gender, Race and Urban/Rural Residence

No differences in the distributions of Medicaid, privately insured or uninsured children are evident by gender (Table II-4). However, Medicaid children were more likely to be nonwhite and to live in core counties of metropolitan statistical areas (MSAs) than both privately insured and uninsured children. Among these three groups of children, privately insured children were most likely to be white and to live in non-core urban areas.

Participation and visit rates broken out by gender, race and the metropolitan designation of the child's residence are also shown for children by their health insurance category in Figures 1 and 2, respectively. The only differences that were statistically significant were those for privately insured children: white privately insured children were more likely than nonwhite privately insured children to have any preventive care visits and to have the recommended number of visits, and privately insured children living in metropolitan areas were more likely than privately insured children living in nonmetropolitan areas to have any preventive care visits and to have the recommended number of visits. (In the TTT analysis, we found mixed results for Medicaid children by race/ethnicity and the metropolitan designation of the child's county of residence.)

To examine the impact of these and other demographic and socioeconomic variables on the probability and frequency of preventive care visits while holding other factors constant, we ran multivariate regressions on the participation and visit rates. The results are discussed below.

C. Results of the Multivariate Analysis

The results of the multivariate regression analysis support the hypothesis that Medicaid coverage removes financial barriers to preventive care. This is most clearly seen in the results of the first logistic regression in Table II-5, which is restricted to children under six years of age in low-income families. The variable for Medicaid coverage alone suggests that Medicaid children were significantly more likely to have had any preventive care visits in 1987 compared to other low-income children, regardless of insurance status. The odds ratio for children with Medicaid alone compared to insured, low-income children is 2.4 with a 95 percent confidence interval (CI) of 1.3 to 4.4. The coefficient for the Medicaid and other coverage variable is slightly smaller in magnitude and only marginally significant ($p = 0.09$) with an odds ratio of 1.9 and a 95 percent CI in the odds ratio of 0.9 to 3.9.

Furthermore, by comparing Medicaid children to insured children in higher income families in the next two equations in Table II-5, we find that, holding other factors constant, Medicaid children were as likely to have had preventive care visits as children with few or no financial barriers. The coefficients of the variable for Medicaid coverage alone were negative but were not statistically significant in these equations. Thus, the significant differences found in the descriptive analysis were primarily due to non-financial barriers.

Our regression results show, as first reported by Short and Lefkowitz (1992), that there were significant non-financial barriers to preventive care for children in 1987. Furthermore, we found differential effects of mother's education level and the presence of siblings under six years of age for children under three years and those aged three to five years. Low maternal education levels had a larger, negative impact on the probability that older preschoolers had any preventive care visits compared to infants and toddlers. Other siblings younger than six years of age had a significant, negative impact on preventive care use among children under three years of age only - that is, infants and toddlers with preschool-aged siblings were less likely to have had any well-child visits and had fewer of the recommended number of visits than infants and toddlers without siblings. However, the presence of siblings had no significant effect on the probability that children aged three to five years had a preventive care visit. The positive coefficient of the

TABLE II-5
MULTIVARIATE REGRESSION ANALYSIS OF CHILDREN'S PREVENTIVE CARE PARTICIPATION AND VISIT RATES, 1987 NMES

	Participation Rate[1]						Visit Rate[2]	
	0-5 Years <200% FPL		< 3 Years All Incomes		3-5 Years All Incomes		< 3 Years All Incomes	
	Beta	*t*	Beta	*t*	Beta	*t*	Beta	*t*
Intercept	**1.032**	**2.04#**	**3.082**	**4.11†**	**-0.522**	**-0.88**	**0.499**	**7.64†**
Age	-0.316	-5.52†	-0.859	-5.19†	0.146	1.34	0.097	4.78†
Gender (v. female)								
Male	-0.003	- 0.02	-0.066	-0.38	0.327	1.69	-0.027	-1.36
Race/Ethnicity (v. other)								
Hispanic	-0.229	-0.90	-0.166	-0.59	-0.229	-0.70	-0.052	-1.41
Black, non-Hispanic	0.096	0.45	-0.188	-0.70	0.285	1.42	0.011	0.32
No. of bed disability days	0.018	1.47	0.012	1.40	0.036	2.72*	-0.003	-4.41†
Perceived health (v. very good to excellent)								
Less than 1 year	0.473	2.23#	-0.575	-1.59	0.023	0.11	0.138	4.02†
Good	-0.169	-0.80	-0.300	-1.16	-0.193	-0.88	-0.049	-1.70
Fair to poor	0.023	0.07	-0.492	-1.16	0.144	0.40	0.076	1.31
Family income/poverty level	0.247	1.50	0.051	0.87	-0.019	-0.51	0.009	2.00#
Insurance coverage (v. < 200% FPL, insured in 1st col. & ≥ 200% FPL, insured in other cols.)								
Medicaid alone	0.878	2.88*	-0.372	-1.02	-0.217	-0.68	-0.009	-0.19
Medicaid and other insurance	0.625	1.71	0.027	0.06	-0.334	-0.86	-0.045	-0.74
< 200% FPL, uninsured	0.096	0.40	-0.616	-1.50	-0.843	-2.09#	0.131	3.16*
< 200% FPL, insured	---	---	-0.863	-2.92*	-0.646	-2.37#	0.044	1.26
≥ 200% FPL, uninsured	---	---	0.494	0.97	-0.248	-0.48	0.072	1.30
Mother/Caregiver's Characteristics								
Married (v. not married)	0.246	1.01	0.291	1.04	-0.207	-0.92	0.035	0.92
< 21 years (v. 21 + years)	0.608	1.96	0.225	0.58	0.938	1.47	0.069	1.42
Employed (v. unemployed)	-0.133	-0.66	-0.074	-0.31	-0.333	-1.81	-0.035	-1.50
Mother's Education (v. some college)								
Less than high school	-0.995	-3.72†	-0.496	-1.54	-0.819	-3.35*	-0.096	-2.86*
High school graduate	-0.332	-1.19	-0.071	-0.29	-0.162	-0.93	-0.082	-3.54†

TABLE II-5 (continued)

	Participation Rate[1]						Visit Rate[2]	
	0-5 Years <200% FPL		< 3 Years All Incomes		3-5 Years All Incomes		< 3 Years All Incomes	
	Beta	*t*	Beta	*t*	Beta	*t*	Beta	*t*
Mother lives with mother (v. lives in other houshold)	0.327	1.12	-0.279	-0.73	-0.194	-0.63	-0.076	-1.55
No mother in household (v. mother present)	0.051	0.10	1.623	1.76	-0.233	-0.47	-0.025	-0.29
Number of siblings < 6 yrs	-0.242	-2.06#	-0.405	-3.20*	0.091	0.79	-0.038	-2.13#
Metropolitan Residence (v. non-metro)								
Core metropolitan area	0.104	0.36	0.258	0.96	0.124	0.47	0.046	1.49
Other metropolitan area	0.246	1.06	0.199	0.87	0.416	1.76	0.071	2.33#
Region (v. West)								
Northeast	0.232	0.69	0.640	1.61	0.585	1.98	0.086	2.82*
Midwest	-0.733	-2.12#	-0.196	-0.60	-0.192	-0.71	0.093	2.89*
South	-0.574	-1.76	-0.283	-0.93	-0.489	-1.79	0.033	1.08
Sample size	951		1,073		1,126		803	
Chi-squared	185.5†		462.5†		154.9†		--	
R-bar squared	--		--		--		0.149	

† p-value ≤ 0.001
* p-value ≤ 0.01
# p-value ≤ 0.05

[1] Estimated with the SUDAAN logistic regression procedure.
[2] Estimated with the SUDAAN ordinary least squares regression procedure.

number of bed disability days variable suggests that illness episodes also had a positive impact on the probability of any preventive care visits, but it was statistically significant only for the older preschoolers. Furthermore, among children under three with visits, lower family incomes, a greater number of bed disability days, and a nonmetropolitan residence lowered the probability that the child had all recommended preventive care visits. These results suggest that because of the disproportionately large share of Medicaid children with characteristics that have negative influences on preventive care use compared to privately insured children in moderate-to-high-income families, the improvement in financial access to care provided by Medicaid coverage may not be sufficient to ensure equal overall access to preventive care.

D. Discussion and Conclusions

In this analysis, we used the 1987 NMES to determine: (1) the generalizability of the preventive care participation and visit rates computed with the TTT claims data; (2) the extent to which children enrolled in Medicaid had preventive care visits outside of the Medicaid program; (3) whether Medicaid children had preventive care visits more or less frequently than privately insured and uninsured children; and (4) the demographic and socioeconomic characteristics that explain variations in the probability and frequency of preventive care visits among preschool-aged children.

The participation and visit rates computed with Medicaid-covered preventive care visits from the 1987 NMES data fell within the range of rates computed for the four TTT States with the 1989 claims data. This suggests that we may consider the results from the four TTT States representative of most States. In addition, we found that while the majority of preventive care visits among children enrolled in Medicaid in 1987 were covered by Medicaid, more than 10 percent were covered by other sources. Therefore, under conditions similar to those prevailing in 1987, measures of preventive care use among Medicaid children computed from claims data could be underestimated by a small but not insignificant amount.

We found that Medicaid children had significantly more visits than uninsured children, suggesting that Medicaid coverage improved access to preventive care among low-income

children who otherwise would have been uninsured. In the descriptive analysis, we also found significant differences in preventive care use between Medicaid children and privately insured children in families with moderate to high incomes. However, after holding other factors constant in the multivariate analysis, Medicaid children were as likely as privately insured children in moderate to high income families to have had any preventive care visits and, among those with visits, to have had the recommended number of visits. This suggests that the differences found in the descriptive analysis were due primarily to non-financial barriers. Important non-financial barriers were the education level of the child's mother and whether other young children were also present in the household. These factors had differential effects on infants and toddlers and older preschoolers.

Our findings confirm Short and Lefkowitz's conclusion that strategies to improve rates of preventive care use among preschool-aged children in the United States must go beyond financial incentives alone (Short and Lefkowitz, 1992). Also required are programs aimed at increasing awareness of the importance of preventive care and facilitating access for mothers who may need child care services for their other children. Finally, we found all groups of children in the United States received many fewer preventive care visits than recommended by the AAP. Thus, broad-based education and other activities aimed at increasing routine well-child care are also needed.

III. COMPARISON OF PROVIDERS OF CHILDREN'S HEALTH CARE SERVICES BY SOURCE OF PAYMENT

Medicaid children are believed to have inadequate access to health care and to have particular difficulties gaining access to office-based physicians (Perloff, Kletke and Fossett, 1995). The equal access provision of OBRA-89 was aimed at addressing this issue. The provision required that, in any given geographic area, Medicaid payments be adequate to ensure the availability of pediatric services to the Medicaid child population at levels equivalent to the general child population. However, several studies have found Medicaid fee levels to affect the site of ambulatory care more than the probability of care or the number of visits (Cohen and Cunningham, 1993; Long, Settle and Stuart, 1986; Cohen, 1989; 1993).[9]

In an analysis of data from the National Health Interview Surveys (NHIS), we found that Medicaid children, prior to OBRA-89, were more likely than other insured children to use settings of care other than physicians' offices (Gavin, 1996). In addition, we found that Medicaid children were more likely than other low-income children but less likely than children in families with moderate to high incomes to have both a usual source of routine care and a usual source of illness-related care and that Medicaid children were less likely than other insured children to use the same source of care for both routine and illness-related care. Furthermore, Medicaid children reported similar types of usual sources of care as uninsured children but considerably different sources than other low-income insured children and children in families with moderate to high incomes. Medicaid children were less likely to report a physician's office and more likely to report either a neighborhood clinic or a hospital outpatient department as their usual source of routine or illness-related care.

Whether a child has an identifiable usual source of care has important cost and quality implications. A usual source of care is believed to increase continuity in care and decrease the costs of care by reducing waiting times for an appointment, eliminating duplicate diagnostic

[9] Another study that used claims data, a broader Medicaid fee variable, and more sophisticated econometric techniques found significant effects of physician fee generosity on both the levels and the settings of care among Medicaid children (Wade, 1992).

services, and encouraging greater compliance with recommended schedules for preventive care and maintenance treatment for chronic conditions. Individuals without a usual source of care are believed to use less preventive care and to experience greater delays in receiving illness-related care and, therefore, to need costly emergency care.

Besides the existence of a usual source of care, the type of the usual source of care also has cost and quality implications. Services provided in hospital outpatient facilities are generally more costly than services provided in other ambulatory settings. However, in a recent study of claims and medical records for a Maryland Medicaid population, Starfield et al. (1994) found hospital outpatient facilities to score no better on overall quality and slightly worse on access measures than office-based practices or community health centers.

Furthermore, merely identifying a usual source of care does not necessarily mean that the patient uses that source for most of his/her health care needs. Some patients with a regular source of care for ongoing medical problems may prefer to use emergency rooms (ERs) for unexpected illnesses (Baker, Stevens, and Brook, 1994). In addition, physicians in small private practices must refer their patients to other settings, such as hospital outpatient departments (OPDs), for diagnostic services and specialist care.

In light of the potential cost and quality implications of the differences in the settings of care among Medicaid and other children, we took a closer look at Medicaid children's sources of care using detailed event-level data from the 1987 NMES. We first investigated whether Medicaid children received different types of care - well-child, illness-related, and pregnancy-related care - at the same levels, in the same settings, and from the same types of providers as other children in the United States. We then investigated the relationship between the children's reported usual sources of care and the frequency with which they used various sites of ambulatory care and the factors that affected the choice of care setting. In particular, we explored the following questions:

- How did the levels of use for well-child, illness-related, and pregnancy-related care differ between Medicaid and other children in each ambulatory care setting - office, clinic, hospital OPD, ER and other?

- How did the reported usual and most frequently used sources of ambulatory care differ between Medicaid children and privately insured and uninsured children in high- and low-income families in the United States?

- What are the most important determinants of children's reported usual source of ambulatory care and their most frequently used source of ambulatory care? How do the two sets of determinants differ?

A. Data and Methods

The 1987 NMES data are uniquely suited to study these questions. The file contains details on the settings, provider types, and reasons for each ambulatory visit made by a representative sample of children in the United States in 1987. In addition, respondents for children over one year of age were asked to supply the children's usual source of care. We conducted both descriptive and multivariate analyses with these data. The data definitions and statistical methods used in each are described in turn below.

1. Descriptive Analysis

For the descriptive analyses, we restricted the sample to children with visits and then categorized these children into three groups: (1) children for whom all visits were covered by Medicaid; (2) children for whom no visits were covered by Medicaid; and (3) children who had both Medicaid- and non-Medicaid-covered visits. Because we wanted to compare the settings and provider specialties used under the Medicaid program versus other funding sources and because of the small number of children with both Medicaid and non-Medicaid visits, we dropped this third group of children from the analysis.

For each child in the analysis, we categorized their visits into preventive care (well-child) visits, illness-related visits, and pregnancy-related visits and classified each by setting of care and provider type.[10] Five settings of care were identified: physicians' offices, clinics, hospital OPDs, ERs, and other settings. Visit records were classified as clinic visits if they were in the medical provider visit file and the setting of care was physicians' clinic; neighborhood health center; company, school or other clinic; or hospital clinic/ER. All (and only) records in the hospital outpatient visit file were coded as hospital OPD visits, and all (and only) records in the hospital emergency room file were coded as ER visits.

The usual and dominant setting of care variables were similarly recoded into the five settings of care. The usual source of care question listed HMOs as a distinct setting of care; HMOs were not differentiated on the visit records. Because the majority of ambulatory visits among children with HMOs reported as a usual source of care were at sites coded as clinics on the visit records, we recoded HMOs as clinics. We identified each child's dominant setting of care as the setting at which s/he made the greatest number of visits in 1987. In the case of ties (two settings with the greatest number of visits), we chose the dominant setting of care according to the following hierarchy: first office, then clinics, hospital OPDs, ERs, and other settings of care in that order.

The child populations with known values for the reported usual source of care and the dominant settings of care variables differ. The reported usual source of care was collected in the health status questionnaire which was not administered to infants (i.e., children under one year of age). However, it was collected for all other children, regardless of whether the children had any medical care contacts during the year. On the other hand, the dominant setting of care is by definition known only for children with ambulatory visits, including infants. Children with no visits were more likely to have clinics and hospital OPDs reported as a usual source of care compared to children with visits. Infants were more likely to have physicians' offices and hospital OPDs as dominant settings of care compared to older children. For comparability, we excluded infants from the analyses of most frequently used settings of care presented below.

[10] Preventive care visits were defined in the same manner as described in Chapter II. These visits are interchangeably called preventive care and well-child visits in this chapter.

We also stratified preventive and illness-related care visits in the medical provider visit file by provider specialty, where provider specialty was recoded into five categories: pediatricians, other primary care, other physicians, non-physicians, and unknown provider type. For pregnancy-related visits in the medical provider file, we also recoded provider specialty into five categories. However, instead of pediatricians, the first category is obstetricians. Because the hospital OPD and ER visit questionnaires did not ask for provider type, we classified all these visits as institutional providers. The survey did provide information on whether a physician was seen during these visits. We show these data in a separate table.

For each of the three types of visits and for all visits made by children with Medicaid-covered visits only and those with only non-Medicaid-covered visits, we computed the weighted average number of visits made in each setting and with each provider specialty. We then performed a t-test of differences in the average number of visits for each setting and provider specialty. We also performed a test of differences in the full array of settings and provider specialties. For each analysis, we rescaled sample weights to equal the number of children in the analysis and controlled for the children's age group.[11]

2. Multivariate Analysis

We then ran multinomial logistic regressions on the children's reported usual source of care and their most frequently used (or dominant) source of care.[12] For the dominant source of care, we ran separate equations for well-child and illness-related visits, as well as for all ambulatory visits. The number of pregnancy-related cases with usable data (50) was too small for reliable estimates and therefore was not run.

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[11] We performed the analysis with the SAS GLM procedure.

[12] We used SUDAAN's new MULTILOG procedure that fits a generalized multinomial logit model to categorical outcomes with more than two, nonordered categories. The procedure is specifically designed to correctly estimate standard errors for observations drawn from finite populations via complex sampling schemes where the "identically and independently distributed" assumption does not hold.

To control for possible correlations among family members, we randomly chose a single child per household to include in the regressions. The reported usual source of care equation includes children with no visits. In both the usual-source-of-care and the dominant-setting-of-care regressions, we excluded children under one year of age.

The dependent variables were coded so that the omitted category is physicians' offices. Therefore, the exponential of the coefficient is the log-odds related to the explanatory variable that the given setting is chosen over physicians' offices as a place of care. The explanatory variables entered into the regressions are the same as those used in the preventive care equations described in the previous chapter.

B. Results of the Descriptive Analysis

1. Setting of Care

The average number of visits per child with visits and the percentage distribution of visits by setting of care and Medicaid status are shown in Table III-1 separately for well-child visits, illness-related visits, and pregnancy-related visits and for all three types of visits aggregated together. The levels and percentage distributions of visits over the different settings varied by both the reason for the visit and Medicaid coverage.

The majority of all ambulatory visits made by children in 1987 were to physicians' offices - 50 percent of Medicaid-covered visits and 59 percent of non-Medicaid-covered visits. Greater percentages of visits for well-child and pregnancy-related care were made at physicians' offices compared to illness-related visits. The second most frequent setting of care was clinics; one fourth of both Medicaid- and non-Medicaid-covered visits in 1987 were made at clinics. Compared to both well-child and illness-related visits, proportionately fewer pregnancy-related

TABLE III-1

THE PERCENTAGE DISTRIBUTION OF VISITS OVER SETTINGS OF CARE AND THE AVERAGE NUMBER OF VISITS PER CHILD WITH VISITS BY SETTING OF CARE, REASON FOR VISIT AND MEDICAID STATUS

	Well-child		Illness-related		Pregnancy-related		Total Visits	
	Medicaid	Other	Medicaid	Other	Medicaid	Other	Medicaid	Other
No. children with visits	504	2,672	900	5,621	49	110	1,029	6,375
Percentage Distribution of All Visits								
Office	53.7%	69.5%	49.9%	57.0%	55.7%	67.9%	50.4%	59.1%
Clinic	33.5%	24.9%	22.8%	25.4%	16.7%	17.4%	25.2%	25.2%
Hospital OPD	12.6%	3.5%	10.4%	6.9%	25.1%	9.4%	11.5%	6.5%
Emergency room	--	--	14.7%	6.8%	2.5%	4.2%	11.2%	5.8%
Other	0.1%	1.9%	1.9%	3.2%	0.0%	1.1%	1.4%	3.0%
Unknown	0.1%	0.2%	0.4%	0.6%	0.0%	0.0%	0.3%	0.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Weighted Average Number of Visits Per Child with Visits								
Office	0.88***	1.18	1.75***	2.69	2.88	3.24	1.87***	2.92
Clinic	0.55**	0.42	0.80	1.20	0.86	0.83	0.93	1.24
Hospital OPD	0.21***	0.06	0.36	0.33	1.29*	0.45	0.43	0.32
Emergency room	-.-	-.-	0.51***	0.32	0.13	0.20	0.41***	0.28
Other	<0.01	0.03	0.06*	0.15	0.0	0.05	0.05**	0.15
Unknown	<0.01	<0.01	0.01	0.03	0.0	0.0	0.01	0.03
Total	1.64†	1.69	3.50***†	4.72	5.16	4.76	3.71***†	4.94

SOURCE: 1987 National Medical Expenditure Survey

*** Test of difference in estimate values for that setting has a p-value < 0.001.

** Test of difference in estimate values for that setting has a p-value < 0.01.

* Test of difference in estimate values for that setting has a p-value < 0.05.

† Multivariate analysis of variance test of difference is full response vectors has a p-value < 0.001.

visits were made at clinics and proportionately more were made at hospital OPDs, regardless of the child's payment source.

We tested the equality of the average levels of visits at each of the different settings for each of the three visit types and the overall level of visits among children with only Medicaid-covered visits and those with no Medicaid-covered visits. The results of each visit type are described in turn below.

Well-child visits. Children with well-child visits had the same approximate number of visits, regardless of insurance coverage – nearly 1.7 visits on average. However, Medicaid-covered well-child visits were significantly less likely to be at physicians' offices and significantly more likely to be at clinics and hospital OPDs than visits covered by other payment sources.

Illness-related visits. Medicaid children with illness-related visits had significantly fewer visits than children without Medicaid coverage: children with only Medicaid-covered visits had 3.5 illness-related visits on average compared to 4.7 illness-related visits among children with no Medicaid-covered visits. While Medicaid children had significantly fewer office-based visits for care related to illnesses, they had significantly more ER visits. These findings are consistent with the hypothesis that Medicaid children have inadequate access to care in general and office-based care in particular. However, they may also be the result of differing care-seeking behavior.

Pregnancy-related visits. The number of young women with pregnancy-related visits is too small for reliable comparisons of average levels of visits in each of the different settings. Our only marginally significant finding is a higher proportion of visits in hospital OPDs among Medicaid-covered young women compared to young women with no Medicaid coverage. There is no difference in the overall level of pregnancy-related visits between the two groups of young women: in 1987, pregnant women under 21 years of age with only Medicaid-covered visits received at least as many outpatient visits as pregnant women under 21 with visits covered by other payment sources.

Overall visits. The patterns seen for the overall visit averages mirror those for illness-related visits, the single largest component of the aggregate. Children with only Medicaid-covered visits had fewer overall ambulatory visits compared to children with no Medicaid-covered visits. In particular, Medicaid children had significantly fewer office-based visits. At the same time, they had a significantly greater average number of ER visits.

2. Provider Specialty

We performed a similar analysis of the distribution and levels of outpatient visits by provider specialty. The average number of well-child and illness-related visits and the percentage distribution of these visits by provider specialty are shown in Table III-2. Because the providers of pregnancy-related care differ from those of other health care services for children, we show the average levels and the percentage distribution of these visits separately in Table III-3.

The specialty of providers seen by children during ambulatory visits in 1987 varied by reason for visit, as well as by whether the visits were covered by Medicaid. Children were more likely to see pediatricians for well-child care than illness-related care, regardless of payment source. Conversely, they were more likely to see institutional providers, physicians with non-primary care specialties, and non-physician practitioners for illness-related care compared to well-child care.

We tested the equality of the average levels of visits to each of the different specialties for each of the three visit types and the overall level of visits by children with only Medicaid-covered visits and those with no Medicaid-covered visits. The results of each visit type are described in turn below.

Well-child visits. Children in the NMES sample with only Medicaid-covered visits in 1987 had fewer well-child care visits attended by pediatricians and more well-child visits attended by institutional providers compared to children with no Medicaid-covered visits (Table III-2).

TABLE III-2

THE PERCENTAGE DISTRIBUTION OF VISITS BY PROVIDER SPECIALTY AND THE AVERAGE NUMBER OF VISITS PER CHILD WITH VISITS BY PROVIDER SPECIALTY, REASON FOR VISIT AND MEDICAID STATUS

	Well-child		Illness-related		Total Visits	
	Medicaid	Other	Medicaid	Other	Medicaid	Other
No. children with visits	504	2,672	900	5,621	1,015	6,353
Percentage Distribution of All Visits						
Pediatrician	32.2%	46.3%	16.5%	18.6%	19.6%	22.6%
Other primary physician	23.4%	19.8%	23.1%	16.5%	23.2%	17.0%
Other physician	4.9%	2.9%	6.7%	13.6%	6.1%	12.0%
Non-physician	8.1%	11.6%	18.0%	25.3%	16.5%	23.3%
Institutional provider	12.6%	3.5%	24.7%	13.3%	21.8%	11.9%
Unknown	18.7%	15.9%	11.0%	12.7%	12.8%	13.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Weighted Average Number of Visits Per Child						
Pediatrician	0.53***	0.78	0.58***	0.88	0.71***	1.10
Other primary physician	0.39	0.34	0.81	0.78	0.84	0.83
Other physician	0.08	0.05	0.24***	0.64	0.22***	0.59
Non-physician	0.13	0.20	0.63*	1.19	0.60*	1.14
Institutional provider	0.21***	0.06	0.87***	0.63	0.79**	0.58
Unknown	0.31	0.27	0.38	0.60	0.46	0.64
Total	1.64†	1.69	3.50***†	4.72	3.63***†	4.88

SOURCE: 1987 National Medical Expenditure Survey

*** Test of difference in estimate values for that setting has a p-value ≤ 0.001.

** Test of difference in estimate values for that setting has a p-value < 0.01.

* Test of difference in estimate values for that setting has a p-value < 0.05.

† Multivariate analysis of variance test of difference is full response vectors has a p-value < 0.001.

TABLE III-3

THE PERCENTAGE DISTRIBUTION OF PREGNANCY-RELATED VISITS OVER PROVIDER SPECIALTY AND THE AVERAGE NUMBER OF PREGNANCY-RELATED VISITS PER CHILD WITH VISITS BY PROVIDER SPECIALTY AND MEDICAID STATUS

	Percentage Distribution of Visits		Weighted Average Number of Visits Per Child with Visits	
	Medicaid	Other	Medicaid	Other
No. children with visits	49	110	49	110
Obstetrician	26.3%	32.0%	1.36	1.52
Other primary physician	34.1%	35.1%	1.76	1.67
Other physician	0.0%	3.0%	0.00	0.15
Non-physician	1.7%	4.3%	0.09	0.20
Institutional provider	27.6%	13.3%	1.42	0.63
Unknown	10.3%	12.3%	0.53	0.59
Total	100.0%	100.0%	5.16	4.76

SOURCE: 1987 National Medical Expenditure Survey

Illness-related visits. Similarly, children with only Medicaid-covered visits had significantly fewer illness-related visits attended by pediatricians and more illness-related visits attended by institutional providers compared to children with no Medicaid-covered visits. Medicaid children also had fewer illness-related visits attended by non-primary care physician specialists and non-physician medical practitioners compared to children covered by other payment sources. However, Medicaid children may have seen these type practitioners in institutional settings.

Pregnancy-related visits. Obstetricians were seen during more than one quarter of Medicaid-covered pregnancy-related visits and almost one third of visits not covered by Medicaid among teenagers and 20-year-olds in 1987 (Table III-3). Other primary care specialists were seen in another third of pregnancy-related visits, regardless of payment source. Institutional providers were seen in 28 percent of the visits among young women with only Medicaid-covered visits and only 13 percent of the time among young women with no Medicaid-covered visits.

The percentages of institutional visits during which physicians were seen are shown in Table III-4 by reason for visit and Medicaid status. Physicians were seen for the majority of well-child visits made at institutional settings - 87 percent of well-child visits among children with only Medicaid-covered visits and 82 percent among children with no Medicaid-covered visits. These physicians could be pediatricians, other primary care physicians, or non-primary care specialists. Physicians were seen for a majority of illness-related and pregnancy-related visits made at institutional settings as well. Among illness-related visits with known values for this variable, there was a higher percentage of Medicaid-covered visits (81.5 percent) compared to non-Medicaid-covered visits (64.3 percent) during which a physician was seen. Conversely, among pregnancy-related visits with known values for these variables, physicians were seen during fewer Medicaid-covered visits (61.2 percent) than non-Medicaid-covered visits (72.0 percent). However, because of the high number of unknown codes for this variable on records for both illness-related and pregnancy-related visits, we cannot rule out systematic biases in these results.

TABLE III-4

THE PERCENTAGE OF INSTITUTIONAL VISITS AT WHICH A PHYSICIAN WAS SEEN AND THE AVERAGE NUMBER OF INSTITUTIONAL VISITS PER CHILD WITH VISITS BY WHETHER A PHYSICIAN WAS SEEN, REASON FOR VISIT AND MEDICAID STATUS

	Well-child		Illness-related		Pregnancy-related		Total Visits	
	Medicaid	Other	Medicaid	Other	Medicaid	Other	Medicaid	Other
Number of children with visits	70	149	478	1,979	26	43	528	2,056
Number of visits	108	188	941	3,608	76	84	1,097	3,860
Percentage of visits with known physician seen data	100.0%	98.0%	42.1%	51.1%	85.3%	70.3%	50.3%	53.4%
Percentage Distribution of All Visits								
Physician seen	87.2%	82.0%	81.5%	64.3%	61.2%	72.0%	80.3%	65.8%
No physician seen	12.8%	18.0%	18.5%	35.7%	38.8%	28.0%	19.7%	34.2%
Total with known data	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Weighted Average Number of Visits Per Child								
Physician seen	1.39*	1.02	0.66	0.62	1.32	0.86	0.82	0.68
No physician seen	0.20	0.22	0.15	0.35	0.84	0.33	0.20	0.35
Not given	0.00	0.03	1.12***	0.93	0.37	0.51	1.00*	0.90
Total	1.59	1.27	1.92¶	1.89	2.52	1.70	2.02#	1.94

SOURCE: 1987 National Medical Expenditure Survey

*** Test of difference in estimate values for that setting has a p-value < 0.001.

** Test of difference in estimate values for that setting has a p-value < 0.01.

* Test of difference in estimate values for that setting has a p-value < 0.05.

¶ Multivariate analysis of variance test of difference in the full response vectors has a p-value < 0.01.

Multivariate analysis of variance test of difference in the full response vectors has a p-value < 0.05.

In sum, because Medicaid children saw institutional providers relatively more often than other children and because the NMES data contain less detail on the types of practitioners seen at institutional settings, we could not determine whether the types of practitioners serving Medicaid children differed greatly from those serving children with no Medicaid-covered visits.

3. Reported v. Actual Usual Setting of Care

Table III-5 shows the settings of care that were reported as children's usual sources of care and that they frequented most often in 1987. Physicians' offices were the most commonly reported usual source of care (71.4 percent), as well as the most frequently visited setting of ambulatory care (60.7 percent), among children in 1987. Medicaid children were less likely to report physicians' offices and more likely to report clinics, hospital OPDs, and ERs as their usual sources of care compared to all other groups of children, except uninsured children in low-income families. Similarly, Medicaid children's dominant source of care was less often physicians' offices and more often clinics, OPDs, and ERs compared to other groups of children, except uninsured, low-income children. These findings are consistent with our findings from the 1988 NHIS.

Not surprisingly, the percentage of children reporting physicians' offices as their usual source of care was somewhat higher than the percentage with the most ambulatory visits in physicians' offices. A higher percentage of children had ERs as a dominant setting of care than as a reported usual source of care, with an average difference of eight percentage points. This may be explained by children whose usual sources of care were physicians' offices (or other settings) making visits to ERs for urgent care of unexpected injuries and acute illnesses. However, the percentage differences in children with ERs as dominant settings of care compared to those reporting ERs as usual sources of care varied by health insurance and income group. Privately insured children in moderate-to-high-income families had the smallest difference (just under six percentage points). Medicaid and other low-income children had significantly larger differences, ranging from 12 to 19 percentage points. This disparity suggests either unequal access to care or differing care-seeking behavior among children in different income groups.

TABLE III-5

CHILDREN'S REPORTED USUAL SOURCE OF CARE AND THEIR DOMINANT SETTING FOR AMBULATORY CARE, 1987

	Medicaid		Private Insurance		Uninsured		
	Alone	& Other ins.	< 200% FPL	≥ 200% FPL	< 200% FPL	≥ 200% FPL	All Children
Reported Usual Source of Care [1] *							
Office	60.5%	59.3%	66.0%	77.3%	53.6%	77.7%	71.4%
Clinic	29.2	27.3	26.5	18.5	32.4	14.2	22.1
Hospital OPD	7.7	12.5	5.6	2.1	8.5	2.9	4.1
Emergency room	2.1	0.0	0.8	0.9	1.1	0.7	1.0
Other	0.5	0.8	1.1	1.2	4.3	4.6	1.4
Dominant Source of Care [2] *							
Office	46.7%	43.4%	56.3%	68.2%	38.3%	54.9%	60.7%
Clinic	30.4	24.0	23.2	18.8	34.6	29.8	22.3
Hospital OPD	6.7	12.7	4.3	4.3	7.2	3.1	5 .0
Emergency room	15.4	18.8	13.5	6.8	16.3	10.9	10.0
Other	0.8	1.1	2.6	1.9	3.6	1.3	2.0

SOURCE: 1987 National Medical Expenditure Survey

FPL - Federal poverty level

[1] Includes children with no visits and excludes children under one year.
[2] Excludes children with no visits and children under one year.

* Chi-square test of difference is distributions over setting of care categories for children with diferent insurance coverage has a p-value < .005.

Table III-6 shows children's dominant settings of care further broken out by reason for visit. Medicaid children were less likely to use physicians' offices and more likely to use clinics or hospital settings for both well-child and illness-related care compared to privately insured children in moderate-to-high-income families. On the other hand, Medicaid children and uninsured children in low-income families had similar distributions over dominant settings for illness-related care, but significantly different distributions over dominant settings for well-child care. In particular, compared to uninsured children in low-income families, Medicaid children were more likely to use physicians' offices most often and less likely to use clinics and hospital OPDs most often for well-child care. This suggests that in 1987 Medicaid coverage improved access to office-based care among children who would otherwise have been uninsured, but not at levels equivalent to children with little to no financial barriers.

C. Results of the Multivariate Analysis

To help determine whether the differences in settings of care found among Medicaid and other children in the 1987 NMES were due to factors relating more to access to care or to care-seeking behavior, we ran multinomial logistic regressions on the reported usual source of care and the most frequently used source of all ambulatory visits. The results are shown in Tables III-7 and III-8, respectively.

After controlling for a variety of factors, including age, race/ethnicity, health status, and various characteristics of the child's mother, family, and residence, financial barriers still had a statistically significant impact on the reported usual source of health care among children in 1987. Medicaid children and other children in low-income families, both privately insured and uninsured, were more likely to have reported clinics and hospital OPDs over physicians' offices as their usual sources of care compared to privately insured children in higher income families. Similarly, Medicaid children and children from low-income families with no private insurance coverage were more likely than children in higher income families to have frequented clinics and hospital OPDs over physicians' offices most often in 1987. However, privately insured, low-income children were no more or less likely to have frequented clinics and OPDs over physicians' offices than were children in higher income families. While few children in any

TABLE III-6

PERCENTAGE DISTRIBUTION OF DOMINANT SETTING OF CARE FOR OUTPATIENT VISITS AMONG CHILDREN WITH VISITS BY REASON FOR VISIT, 1987

	Medicaid		Private Insurance		Uninsured		
	Alone	& Other ins.	< 200% FPL	≥ 200% FPL	< 200% FPL	≥ 200% FPL	All Children
Dominant Setting of Well-Child Care [1] *							
Office	46.9%	43.3%	50.1%	73.6%	25.1%	49.5%	62.6%
Clinic	48.4	35.6	38.7	22.4	62.2	39.4	31.0
Hospital OPD	4.2	15.7	8.4	2.7	9.9	7.3	4.7
Other	0.5	5.3	2.9	1.3	2.9	3.9	1.8
Dominant Setting of Illness-related Care [1] *							
Office	46.5%	43.2%	56.1%	66.5%	44.2%	59.5%	60.3%
Clinic	26.7	18.8	20.8	17.9	23.8	24.3	19.9
Hospital OPD	6.3	12.2	4.4	4.6	6.4	1.4	5 .0
Emergency room	19.3	23.1	16.4	8.9	21.3	13.3	12.7
Other	1.2	2.6	2.3	2.0	4.3	1.5	2.1

SOURCE: 1987 National Medical Expenditure Survey

FPL - Federal Poverty Level

[1] Excludes children with no visits and children under one year.

* Chi-square test of difference is distributions over setting of care categories for children with diferent insurance coverage has a p-value < .005.

TABLE III-7

MULTINOMIAL LOGISTIC REGRESSION ANALYSIS OF CHILDREN'S REPORTED USUAL SOURCE OF AMBULATORY CARE, 1987 NMES

	Clinic v. Office		OPD v. Office		ER v. Office		Other v. Office	
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Intercept	-1.932	-4.18**	-4.907	-5.65**	-4.043	-2.02#	-4.508	-4.09**
Age	0.037	2.56#	0.039	1.69	-0.028	-0.39	0.032	0.60
Gender (v. female)								
Male	0.022	0.21	-0.145	-0.72	0.372	0.78	0.742	1.84
Race/ethnicity (v. other)								
Hispanic	0.450	2.08#	0.831	2.04#	-0.065	-0.10	-1.787	-2.67*
African-American	0.381	2.33#	1.207	4.17**	0.934	1.90	0.275	0.53
No. of bed disability days	-0.014	-1.28	-0.003	-0.08	-0.303	-2.03#	-0.035	-0.75
Perceived health (v. very good to excellent)								
Good	0.172	1.39	0.236	1.00	-0.176	-0.35	0.269	0.45
Fair to poor	0.145	0.74	0.395	0.88	1.654	2.37#	0.990	1.86
Family income/FPL	-0.064	-1.75	-0.031	-0.41	-0.019	-0.36	-0.214	-1.87
Financial Barriers (v. private ins., ≥ 200% FPL)								
Medicaid alone	0.603	2.94*	1.013	2.17#	-0.567	-0.00	-0.910	-1.04
Medicaid & other insurance	0.555	1.96	1.466	2.90*	-9.893	-11.78**	-0.154	-0.14
Uninsured, <200% FPL	0.791	3.52**	1.638	3.99**	-0.594	-0.62	1.241	1.61
Uninsured, ≥ 200% FPL	-0.571	-1.86	0.248	0.40	-1.337	-1.46	1.348	1.90
Private ins., <200% FPL	0.470	2.27#	1.177	2.92*	-0.588	-0.69	-0.147	-0.23
Mother's Characteristics								
Married (v. not married)	-0.003	-0.02	-0.138	-0.46	-0.444	-0.86	0.270	0.63
< 21 yrs (v. 21+ yrs)	1.052	2.17#	-10.215	-22.80**	3.214	3.34*	-9.209	-8.87**
Employed (v. unemployed)	0.567	4.35**	0.196	0.84	-0.829	-1.35	0.002	0.00
Mother's Education (v. some college)								
Less than high school	0.117	0.69	-0.040	-0.12	1.366	2.07#	0.132	0.16
High school graduate	-0.125	-1.04	-0.223	-0.79	1.050	1.64	-0.739	-1.24
Mother lives with mother (v. lives in other houshold)	0.423	1.74	0.297	0.53	-0.015	-0.02	-1.626	-1.39
No mother in household (v. mother present)	-0.090	-0.31	-0.683	-1.09	-0.848	-1.06	-1.595	-1.43
No. of children < 6 yrs	0.131	1.46	0.192	1.33	-0.927	-1.60	-0.047	-0.13

TABLE III-7 (continued)

	Clinic v. Office		OPD v. Office		ER v. Office		Other v. Office	
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Metropolitan Residence (v. non-metro)								
Core metropolitan area	0.371	1.21	1.734	3.83**	0.277	0.40	1.221	1.53
Other metropolitan area	0.316	1.05	1.305	2.74*	0.126	0.27	1.384	2.01#
Region (v. West)								
Northeast	-1.183	-5.42**	-0.422	-1.15	0.638	0.56	-1.697	-2.58#
Midwest	-0.176	-0.70	-0.503	-1.25	-0.784	-0.63	-1.589	-2.10#
South	-0.749	-3.55**	-0.860	-2.20#	0.037	0.03	-0.476	-0.94
Sample size	3,291							
Adjusted Chi-squared	737.98**							

** p-value ≤ 0.001
* p-value ≤ 0.01
# p-value ≤ 0.05

FPL - Federal poverty level

TABLE III-8

MULTINOMIAL LOGISTIC REGRESSION ANALYSIS OF CHILDREN'S DOMINANT SETTING FOR ALL AMBULATORY VISITS, 1987 NMES

	Clinic v. Office		OPD v. Office		ER v. Office		Other v. Office	
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Intercept	-1.425	-3.69**	-2.713	-4.27**	-2.947	-5.10**	-3.692	-3.05*
Age	0.024	1.41	0.011	0.54	0.010	0.48	0.028	0.78
Gender (v. female)								
Male	0.065	0.59	0.282	1.42	0.410	2.49#	-0.280	-0.92
Race/Ethnicity (v. other)								
Hispanic	0.495	2.44#	-0.218	-0.57	0.191	0.55	-0.578	-0.71
African-American	0.632	3.50**	0.306	2.96*	0.715	2.98*	-0.245	-0.49
No. of bed disability days	-0.018	-1.74	0.008	0.28	0.018	1.60#	-0.038	-0.68
Perceived health (v. very good to excellent)								
Good	0.135	1.01	0.300	1.71	0.009	0.05	-0.093	-0.26
Fair to poor	0.052	0.25	0.280	0.69	0.092	0.32	-1.046	-1.61
Family income/FPL	-0.065	-2.29#	-0.118	-1.98	-0.014	-0.23	-0.114	-1.09
Financial Barriers (v. private ins., ≥ 200% FPL)								
Medicaid alone	0.456	2.12#	0.482	1.20	0.765	2.37#	-0.390	-0.47
Medicaid & other insurance	0.175	0.63	1.120	2.48#	1.205	2.95*	0.494	0.47
Uninsured, < 200% FPL	1.211	5.19**	0.983	2.03#	1.310	3.30*	1.432	2.08#
Uninsured, ≥ 200% FPL	0.613	1.64	0.101	0.17	0.138	0.29	-9.559	-27.48**
Private ins., < 200% FPL	0.208	1.07	0.267	0.67	0.723	2.44#	0.670	1.40
Mother's Characteristics								
Married (v. not married)	0.017	0.13	0.029	0.11	-0.233	-1.02	0.250	0.51
< 21 years (v. 21+ years)	0.595	0.90	0.593	0.80	0.879	1.47	2.241	1.74
Employed (v. unemployed)	0.193	1.26	0.070	0.28	0.080	0.43	0.153	0.39
Mother's Education (v. some college)								
Less than high school	-0.210	-1.11	0.077	0.25	0.239	0.87	-0.235	-0.47
High school graduate	-0.225	-1.65	-0.272	-1.10	0.310	1.41	-0.063	-0.15
Mother lives with mother (v. lives in other houshold)	0.398	1.45	0.231	0.54	0.435	1.12	-1.366	-1.30
No mother in household (v. mother present)	-0.358	-1.40	-0.503	-1.05	0.181	0.56	-0.366	-0.40
No. of children < 6 yrs	0.033	0.30	-0.174	-0.96	-0.151	-1.09	-0.264	-0.91

TABLE III-8 (continued)

	Clinic v. Office		OPD v. Office		ER v. Office		Other v. Office	
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Metropolitan Residence (v. non-metro)								
Core metropolitan area	0.108	0.50	0.995	2.98*	0.160	0.51	0.316	0.58
Other metropolitan area	0.085	0.44	0.552	1.67	0.304	1.36	1.107	2.39#
Region (v. West)								
Northeast	-0.406	-2.68*	-0.701	-2.16#	-0.087	-0.29	-0.658	-1.22
Midwest	0.075	0.44	-0.665	-2.79#	-0.109	-0.36	-0.457	-0.86
South	-0.252	-1.60	-0.872	-2.63*	0.207	0.61	-0.329	-0.65
Sample size	2,892							
Adjusted Chi-squared	810.73**							

** p-value ≤ 0.001
* p-value ≤ 0.01
# p-value ≤ 0.05

FPL - Federal poverty level

health insurance and income group reported ERs as their usual source of care, all groups of low-income children, regardless of insurance coverage, were more likely to have visited ERs more often than physicians' offices compared to privately insured children in higher income families.

The log-odds ratio of the probability that children in the different health insurance and income groups chose clinics, OPDs, and ERs over physicians' offices as usual sources or dominant settings of care in 1987 is shown in Table III-9. The log-odds from similar regressions for the dominant source for well-child and illness-related care are shown in Table III-9 as well. These data show that the likelihood that low-income children used clinics and hospital OPDs over physicians' offices compared to privately insured children in higher income families was much larger for well-child care visits than it was for illness-related visits. Furthermore, the data also reveal that uninsured children in low-income families were clearly more likely than Medicaid children to have used clinics over physicians' offices as a dominant setting for well-child care. Thus, while all low-income children had lower access to office-based care, children with Medicaid coverage had greater access than the uninsured.

Other factors that influenced the choice of clinics over physicians' offices as a usual source of care for children in 1987 include increasing age, Hispanic and African-American race/ethnicity, young mothers (21 years), and working mothers. Factors that influenced the choice of hospital OPDs over physicians' offices are Hispanic and African-American race/ethnicity, older mothers ($\geq$ 21 years), and residence in a metropolitan area. Finally, the choice of an ER as a usual source of care was influenced by younger and less educated mothers, fair to poor health, and fewer bed disability days.[13]

Certain of these variables suggest differences in access among children with different health insurance and family income. For example the significant impact of mothers' employment status on the choice of clinics over physicians' offices may be related to more convenient hours of operation among clinics compared to physicians' offices. Clinics are more likely to be open in the evenings and on weekends fitting better with mothers' work schedules. Also, the significant

[13] The latter two effects appear contradictory and may cancel each other out.

TABLE III-9
MEAN (AND 95% CONFIDENCE INTERVALS) FOR THE LOG-ODDS RATIO OF THE PROBABILITY OF FREQUENTING DIFFERENT SETTINGS OF CARE MOST OFTEN OVER PHYSICIANS OFFICES

	Reported Usual Source of Care		Dominant Setting for All Visits		Dominant Setting for Well-Child Visits		Dominant Setting for Illness-related Visits	
Clinic v. Office								
Medicaid alone	1.8	(1.2-2.7)*	1.6	(1.0-2.4)#	1.6	(0.8-3.1)	1.5	(0.9-2.5)
Medicaid & other insurance	1.7	(1.0-3.1)	1.2	(0.7-2.1)	1.5	(0.8-3.2)	0.9	(0.4-1.8)
Uninsured, < 200% FPL	2.2	(1.4-3.4)*	3.4	(2.1-5.3)**	8.0	(4.0-16.1)*	1.9	(1.2-3.0)*
Uninsured, ≥ 200% FPL	0.6	(0.3-1.0)	1.8	(0.9-3.9)	1.8	(0.6-5.5)	1.6	(0.7-3.6)
Private ins., < 200% FPL	1.6	(1.1-2.4)#	1.2	(0.8-1.8)	1.5	(0.8-2.8)	1.2	(0.8-1.9)
Hospital OPD v. Office								
Medicaid alone	2.8	(1.1-6.9)#	1.6	(0.7-3.6)	2.5	(0.8-8.5)	1.4	(0.6-3.2)
Medicaid & other insurance	4.3	(1.6-11.8)*	3.1	(1.3-7.5)#	8.8	(2.6-30.1)**	2.4	(0.9-6.4)
Uninsured, < 200% FPL	5.1	(2.3-11.6)**	2.7	(1.0-7.0)#	10.3	(2.7-40.2)**	1.8	(0.6-5.2)
Uninsured, ≥ 200% FPL	1.3	(0.4-4.4)	1.1	(0.3-3.5)	2.5	(0.4-15.9)	0.4	(0.1-2.0)
Private ins., < 200% FPL	3.2	(1.5-7.2)*	1.3	(0.6-2.9)	6.1	(2.1-17.3)**	1.2	(0.5-2.7)
Hospital ER v. Office								
Medicaid alone	0.6	(0.1-3.7)	2.1	(1.1-4.1)#	--	--	2.2	(1.2-4.1)#
Medicaid & other insurance	0.0	(0.0-0.0)**	3.3	(1.5-7.5)*	--	--	3.0	(1.3-6.8)*
Uninsured, < 200% FPL	0.6	(0.1-3.7)	3.7	(1.7-8.1)*	--	--	3.6	(1.8-7.1)**
Uninsured, ≥ 200% FPL	0.9	(0.2-3.1)	1.1	(0.4-2.9)	--	--	1.0	(0.4-2.5)
Private ins., < 200% FPL	0.6	(0.1-3.0)	2.1	(1.1-3.7)#	--	--	2.2	(1.3-3.8)*

** p-value ≤ 0.001
* p-value ≤ 0.01
# p-value ≤ 0.05

impact of a metropolitan residence on the choice of hospital OPDs over physicians' offices suggest access differentials: hospital OPDs are more likely and physicians' offices are less likely to be located in metropolitan areas where proportionately more low-income children reside. However, the significance of low maternal education levels on the choice of ERs over physicians' offices suggest that care-seeking behavior differs among these groups of children as well.

Demographic characteristics and characteristics of the children's mothers were less significant in determining the most frequently used source of ambulatory care compared to the reported usual source of ambulatory care. The exception was race/ethnicity. African-American children were more likely to have frequented clinics, OPDs and ERs most often compared to children of other race/ethnicities. Hispanic children were also more likely than races other than African-Americans to have had clinics as a dominant source of care. Residence in a core metropolitan area also had a significant, positive impact on the use of OPDs over physicians' offices among children in 1987.

The lower significance of the insurance, demographic and family variables in the equation for the dominant setting of care is not surprising. The reported usual source of care reflects children's expected place of first-contact primary care. On the other hand, the most frequently used source of care is determined by factors beyond the children's demographic and family characteristics. These factors include unexpected health care needs, physicians' treatment decisions, and the comprehensiveness of the primary care providers' practice settings.

D. Discussion and Conclusions

In this analysis, we used the 1987 NMES to investigate how the source of care used by Medicaid children differed from those used by other children in the United States for different types of visits - well-child, illness-related, and pregnancy-related visits. We then investigated the relationship between children's reported usual source of care and the frequency with which they used various sites of ambulatory care and the factors that affected their choice of care setting.

We found that, for children with well-child visits, there was no difference between children with only Medicaid-covered visits and children with no Medicaid-covered visits in the average number of visits per child after adjusting for age, but Medicaid children had relatively fewer well-child visits at physicians' offices and relatively more well-child visits at clinics and hospital OPDs. Similarly, among young women with pregnancy-related visits, we found no difference in the overall average number of visits per woman between Medicaid-covered and other young women, but young women covered by Medicaid had a greater number of visits at hospital OPDs. However, for children with illness-related visits, we not only found fewer office visits per child and a greater percentage of ER visits, we also found Medicaid children with visits had a significantly lower average number of visits per child. These findings are consistent with the hypothesis that Medicaid children had inadequate access to care in general and office-based care in particular.

Further evidence of inadequate access to office-based care is provided by comparing children's reported usual sources of care and the settings of care they used most often during the year. The settings of care reported and used most frequently by Medicaid children more closely matched those of uninsured children in low-income families than privately insured children or children in higher income families. Medicaid children were less likely to report physicians' offices and more likely to report clinics, hospital OPDs and ERs as their usual sources of care compared to all other groups of children, except uninsured children in low-income families. We also found a greater difference in the percentage of children reporting ERs as a usual source of care and those that used ERs most frequently among Medicaid and other low-income children compared to privately insured children in higher income families. Privately insured children in moderate-to-high income families had the smallest difference (just under six percentage points) while Medicaid and other low-income children had significantly larger differences (ranging from 12 to 19 percentage points).

Medicaid coverage, nevertheless, may improve access to office-based well-child care for children who would otherwise be uninsured. Medicaid children and uninsured children in low-income families had similar distributions over the most frequently used setting for illness-related care, but Medicaid children were more likely to use physicians' office most often and less likely

to use clinics and hospital OPDs most often for well-child care compared to uninsured children in low-income families.

The significant effect of children's health insurance and family income on their settings of care persisted in multivariate analyses holding constant health status and selected enabling and predisposing factors. These analyses also suggested that the discrepancies were attributable more to access factors, such as the hours of operation and location of office-based practices, than to differential care-seeking behaviors.

The differences in settings of care are important because of potential cost and quality differences. However, the best setting of care for a Medicaid child population is not clear. In a recent study of care received by a sample of two-year-old Medicaid recipients (Starfield et al., 1994), the authors found that Community Health Centers had significantly better technical quality scores for well-child care than hospital OPDs. Physicians' offices had a technical quality score between these two other settings. Because Medicaid recipients are shown to use both hospital OPDs and clinics more frequently than physicians' offices, whether Medicaid children receive a different quality of care than other children on average is unclear and requires further study.

Furthermore, Medicaid children are more likely than other children to live in depressed inner-city areas, where there are few office-based physicians. Institutions, such as Community Health Centers, local health departments, and hospital OPDs, are typically located in inner cities and therefore are major providers of pediatric care for the poorest Medicaid-eligible child population. These providers may be more cognizant of and better able to handle the health care needs of this population. It is also unclear that any policy aimed at increasing the use of physicians' offices, such as the OBRA-89 access provision, will be more than marginally effective.

Finally, because claims databases typically do not provide patients' usual source of first-contact care, the outpatient setting of care most frequently visited is often used as a proxy. From our analysis, we see that these two variables differ from each other in important ways and that the

differences vary by the type of health insurance coverage. Compared to reported usual settings of care, the most frequently used setting will show a higher percentage of privately insured children with hospital OPDs as a dominant source of care and a higher percentage of all children, especially Medicaid and uninsured children, with ERs as a dominant source of care. These differences should be kept in mind when drawing policy conclusions from claims data analyses.

IV. CHILDREN'S HEALTH CARE EXPENDITURES BY LEVEL OF CARE

Another question posed in the research design for this project is how health care expenditures vary among children with different health insurance coverage. In particular, do Medicaid children have higher or lower health care expenditures than privately insured and uninsured children? For the pre-OBRA-89 period, this question can be addressed with the 1987 NMES.

In this chapter, we investigate health care expenditures for children using the 1987 NMES and a multiple-equation model of health care demand similar to the four-equation model developed by Duan et al. (1983) for the RAND Health Insurance Experiment. The model allows for different health-care-seeking behavior for children who are not ill, children who are mildly ill, and children who are seriously ill. Parents of children with no chronic conditions and with no injuries or acute illnesses during the year need only make decisions on whether to seek preventive and dental care for their children. The child's primary care provider, if s/he has one, may or may not influence the decision. On the other hand, parents of children with a life-threatening injury or illness may have less discretion in decisions on the care received by their children. Physicians typically have greater influence on total service use and expenditures for sick children who need continuing or additional services beyond an initial visit than they do on the total service use and expenditures for well children who need no further care beyond a single well-child or dental visit. Indeed, a patient cannot be hospitalized without an order from an admitting physician. Thus, we would expect the behavioral equation explaining variations in health care expenditures to differ for children depending on their health care needs and the discretionary nature of care; we would expect that family characteristics are very important in decisions to seek preventive/dental care and less important in decisions to seek hospital care.

Our model exploits this possibility by jointly estimating the probabilities of being in these categories and separately estimating the level of expenditures for each category. The model also exploits two other characteristics of the distribution of medical expenditures: (1) that a portion

of the population uses no medical services during the year, and (2) that the distribution of expenditures among users is highly skewed. These features of the model are explained below.

A. Data and Methods

The NMES household survey collected data on expenditures for inpatient hospital care, emergency room services, physician services, nonphysician services, home care, dental services, prescribed medicines, and special medical equipment. These data were verified and supplemented in separate surveys of the children's medical care and health insurance providers. The expenditure data were recorded in the NMES database in both aggregate form by type of service and separately for each medical contact. Therefore, we were able to determine whether the only health care expenditures a child incurred in 1987 were for preventive/dental care visits and to identify children with inpatient hospital expenditures.

We grouped children in the NMES database into five categories by the level of care they received in 1987: (1) no care, (2) preventive and/or dental care only, (3) illness-related care on an outpatient basis only, (4) inpatient care, and (5) children born during the year.[14] Preventive care was defined as any ambulatory visits for general check-ups, well-child care, or immunizations; prenatal and postnatal visits were *not* classified as preventive care. Illness-related care was defined as medical care for all other conditions, including pregnancy. Similarly, inpatient care was defined as hospital stays for all conditions, including birth and delivery. Children were classified into the illness-related outpatient and inpatient categories, regardless of whether they had preventive and/or dental care.

We used this level-of-care variable as a proxy for the level of medical need. While some children without inpatient care may actually be seriously ill and some children with inpatient care may be only mildly ill, we believe that these care categories represent the best method possible to distinguish children by the types of decisions faced by their caregivers.

[14] The total expenditures variable on NMES Tape 18 used for this analysis associates expenditures for birth and delivery to both the infants' and mothers' records.

1. Descriptive Analysis

A complete descriptive analysis of children's health care expenditures by service type and source of payment using the 1987 NMES data has already been published (Lewit and Monheit, 1992). Therefore, we provide only an analysis of the percentage distribution of children in the different health insurance and income groups over the level-of-care categories and the average total expenditures for children in each group. We tested the differences in the distributions and average total expenditures between Medicaid children and children in the other health insurance and income groups for statistical significance with chi-squared and t-statistics, respectively.[15]

2. Multivariate Analysis

The Duan et al. (1983) model of health care expenditures has four equations. The first is a probit equation of the probability of any health care use that separates users from nonusers. The second is a conditional probit equation of the probability of any hospital use given some health care use. This equation separates low-cost from high-cost users. The final two equations are linear equations of the logarithm of total health care expenditures for the two types of users, estimated with the OLS regression procedure.[16]

We also estimated a multiple-equation model, but our equations differed from those of Duan et al. The first equation of our model is a multinomial logistic equation for the probability that a child aged one to 20 years was in one of the first four level-of-care categories. This equation separates users from nonusers and splits the user group into three subgroups reflecting different decision-making processes. We estimated this single equation rather than sequential conditional equations because the interdependence of the decisions to receive preventive and illness-related care can go in either causal direction. That is, the decision to receive preventive

[15] To compute these statistics, we used the SUDAAN program which corrects standard errors for the complex sampling design of NMES.

[16] The logarithmic transformation of annual total expenditures adjusts for the skew in the distribution of expenditures among users. A nonparametric estimate of the retransformation factors, the smearing estimate, developed by Duan et al. (1983), is used to retransform the logarithmic scale to the raw dollar scale.

care may affect the subsequent need for illness-related care. However, the receipt of illness-related care can also result in providers recommending and encouraging subsequent preventive care. Using annual data, we could not determine which occurred first, only that either one or the other or both types of care occurred during the year.[17] The other three equations of our model are linear equations of the logarithms of total annual health care expenditures for the three respective user types.[18] We also ran a linear regression on the logarithm of total health care expenditures among children born in 1987.

As in the other multivariate analyses with the NMES data, we randomly chose one child per household for inclusion in the regressions. The explanatory variables for all equations also are identical to those for the other regressions, with a few additional variables.[19] To all four equations, we added the square of the age variable and a variable for whether the child was a recipient of SSI payments. To the three expenditure equations, we also added a variable for whether the child received any dental care during the year. In addition, in the illness-related equations, we included variables indicating whether the child had been pregnant during the year and whether s/he received any preventive care. In the equation for infants, we dropped age, SSI recipiency, pregnancy and dental care variables because of lack of variation and/or relevance.

B. Results of the Descriptive Analysis

The percentage distribution of children in the different health insurance and income groups over the five level-of-care categories and average total health care expenditures for each group are shown in Table IV-1. Almost 83 percent of all children in the United States had some

[17] While it is possible to determine the relative timing of different services with the NMES data, the number of possible combinations could become very large, making estimation costly and cumbersome, if not impossible.

[18] All equations were estimated with SUDAAN; the first equation was estimated with the new MULTILOG procedure and the others with the OLS procedure REGRESS.

[19] We dropped perceived health status from the expenditure equations presented here because of the large number of unknown values for this variable. However, we ran the equations with this variable included and found no substantial differences in the regression results.

TABLE IV-1

PERCENTAGE DISTRIBUTION OF CHILDREN OVER LEVEL-OF-CARE CATEGORIES AND AVERAGE MEDICAL EXPENDITURES IN EACH CATEGORY, 1987 NMES

Level of Care	Medicaid		Private Insurance[1]		Uninsured		All Children
	Alone	& Other Insurance	< 200% FPL	≥ 200% FPL	< 200% FPL	≥ 200% FPL	
Percentage distribution of children*							
No care	20.5%	11.6%	20.0%	11.1%	42.2%	36.9%	17.2%
Preventive/dental care only	5.8	6.5	5.1	4.0	5.0	4.9	4.6
Illness-related, outpatient only	62.3	69.3	65.9	76.9	46.4	53.2	69.7
Inpatient care							
Infant	7.4	6.0	4.7	4.9	4.9	3.6	5.2
Children 1+ years	3.9	6.7	4.3	3.1	1.6	1.4	3.3
All children	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average total expenditures							
All children	$807[a]	$910[a]	$749[a]	$870[a]	$520[b]	$343	$810

* The chi-square test of difference in distributions over level of care categories for children with different insurance coverage has a p-value < 0.001.

[1] Includes children with other public coverage for part or all of the year.

[a] This average expenditure is significantly different from that for uninsured children in high-income families (p-value ≤ 0.01).

[b] This average expenditure is significantly different from that for uninsured children in low-income families (p-value < 0.01).

health care in 1987. However, the level of care received by children differed significantly by their health insurance coverage and family income.

Uninsured children in low-income families were the most likely to have had no care in 1987 (42 percent) while children with private coverage in moderate-to-high-income families were the least likely to have had no care (11 percent). Privately insured children in the higher income families were the most likely to have had illness-related care and the least likely to have had only preventive/dental care. Uninsured children were the least likely to have had any illness-related care - 53 percent of uninsured children in low-income families and 58 percent of uninsured children in moderate-to-high-income families had illness-related care compared to 85 percent of privately insured children in moderate-to-high-income families. Children with Medicaid alone had a similar distribution over the level-of-care categories as privately insured children in low-income families, although a greater percentage of Medicaid children were infants. Medicaid children (74 percent of those with Medicaid alone and 82 percent of those with Medicaid and other insurance) were more likely than the uninsured but not as likely as privately insured children in moderate-to-high-income families to have had illness-related care.

Total average expenditures for Medicaid children ($807 for children with Medicaid alone and $910 for children with both Medicaid and other insurance) were not statistically different from those of privately insured children ($749 for children in low-income families and $870 for children in moderate-to-high-income families). However, total expenditures for Medicaid children were significantly higher than those for uninsured children ($520 among children in low-income families and $343 for those in moderate-to-high-income families).

These results suggest either that the uninsured had greater unmet health care needs or that they had relatively fewer health care needs than the insured which affected the decision to not obtain health insurance coverage.

C. Results of the Multivariate Analysis

Part of the difference in total health care expenditures between Medicaid and other children in the United States is due to varying provider reimbursements. As we discussed in previous chapters, differing ages, medical need, and other risk factors, as well as differing predisposing and enabling factors, also explain part of the variation between Medicaid and other children in health service use, and thereby expenditures. In the multivariate analysis described below, we show the impact of Medicaid coverage holding these other factors constant. We also show the relative impact of these factors for different types of health care decisions for children.

1. Level-of-Care Probabilities

The results of the multinomial logistic regression of the probability that children aged one to 20 years were in one of the three user groups compared to the nonuser group are presented in Table IV-2. The coefficients of the Medicaid coverage variables were positive, except for the coefficient for Medicaid alone in the choice of inpatient care over no care, but none of the coefficients were statistically significant. These results suggest that if all other things were equal, including health status and enabling and predisposing factors, Medicaid children would have been at least as likely as privately insured children in moderate-to-high-income families to be in each of the different level-of-care categories. On the other hand, after holding these other factors constant, uninsured children were still significantly less likely to be in the illness-related care categories compared to either Medicaid children or privately insured children in moderate-to-high-income families.

We did not find the characteristics of children's mothers and family to have greater significance for the probability that children were in the preventive/dental care only category over no care compared to the illness-related categories over no care, as we had expected. Our findings may only be due to the differing sample sizes in the three user categories. There were 3,423 children in the illness-related outpatient category compared to 221 in the preventive/dental care only category and 166 in the inpatient care category, with 839 children in the no care category.

TABLE IV-2

MULTINOMIAL LOGISTIC REGRESSION ANALYSIS OF THE LEVEL OF HEALTH CARE USED BY CHILDREN AGED ONE THROUGH 20 YEARS, 1987 NMES

	ntive/Dental Only v. No Care		Illness-related Outpatient v. No Care		Illness-related Inpatient v. No Care	
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Intercept	-0.437	-0.57	3.047	6.18**	2.265	2.71*
Age	-0.053	-0.68	-0.044	-1.01	-0.432	-4.44**
Age squared	0.001	0.22	0.000	0.05	0.018	4.28**
Gender (v. female)						
Male	0.138	0.68	-0.184	-1.76	-0.212	-1.02
Race/Ethnicity (v. other)						
Hispanic	-0.544	-1.71	-0.443	-2.64*	-0.305	-0.90
African-American	-0.582	-2.35#	-0.921	-7.16**	-0.868	-2.92*
Health status						
No. of bed disability days	-0.097	-1.32	0.185	3.33*	0.214	3.57**
SSI disabled	1.823	1.31	2.247	2.10#	2.421	1.93
Pregnant in 1987 (v. not)	-8.120	-12.67**	1.330	2.22#	2.523	2.78*
Family income/FPL	0.046	0.75	0.065	1.64	0.064	1.03
Financial Barrier (v. privately insured, ≥200% FPL)						
Medicaid alone	0.227	0.63	0.181	0.75	-0.123	-0.26
Medicaid and other insurance	0.629	1.32	0.357	0.90	0.657	1.23
Uninsured, < 200% FPL	-0.461	-1.21	-0.938	-4.51**	-1.50	-2.47#
Uninsured, ≥200% FPL	-0.540	-1.45	-1.026	-5.33**	-2.196	-2.52#
Privately insured , < 200% FPL	-0.056	-0.17	-0.200	-1.19	-0.118	-0.35
Mother's Characteristics						
Married (vs not married)	-0.183	-0.87	-0.038	-0.24	-0.499	-1.94
< 21 years (vs 21+ years)	2.177	2.62#	1.364	1.93	1.472	1.70
Employed (vs unemployed)	0.185	0.89	-0.172	-1.32	-0.328	-1.04
Mother's Education (vs some college)						
Less than high school	-0.716	-2.25#	-1.253	-8.15**	-1.271	-3.98**
High school graduate	-0.307	-1.08	-0.636	-4.51**	-0.697	-3.29*
Mother lives with mother (vs lives in other houshold)	-0.430	-1.05	-0.521	-2.32#	-0.502	-1.21
No mother in household (vs mother present)	-0.394	-0.93	-0.203	-0.98	-0.246	-0.45
Number of children < 6 yrs	0.084	0.49	-0.196	-1.68	-0.428	-2.03#

TABLE IV-2 (continued)

	Preventive/Dental Only v. No Care		Illness-related Outpatient v. No Care		Illness-related Inpatient v. No Care	
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Metropolitan Residence (vs non-metro)						
Core metropolitan area	0.255	0.89	-0.288	-1.95	-0.623	-1.88
Other metropolitan area	0.119	0.48	0.018	0.13	-0.635	-2.39#
Region (vs West)						
Northeast	0.296	0.90	0.108	0.58	0.016	0.04
Midwest	0.048	0.16	0.135	0.77	0.166	0.46
South	-0.314	-1.00	-0.328	-2.10#	-0.591	-1.57
Sample size	4,649					
Adjusted chi-squared	2,014.17**					

** p-value ≤ 0.001
* p-value ≤ 0.01
# p-value ≤ 0.05

FPL - Federal poverty level

The variables with the greatest significance in determining the level of care received by children include health status, race/ethnicity, and mother's education. Pregnant teenagers, SSI recipients, and children with a greater number of disability days were more likely to be in the illness-related care groups. African-American children were significantly less likely to be in any of the three user groups than other non-Hispanic race/ethnicities. Hispanics were also less likely to be in any of the user categories but they were significantly less likely to be in the illness-related outpatient category only. Children whose mothers had less than a high school education also were significantly less likely to be in any of the three user groups.

2. Total Health Care Expenditures

The results of the OLS regressions of the logarithms of total health care expenditures for infants and for children aged one to 20 years in each of the three user groups are shown in Table IV-3. Among children aged one through 20 years, the only significant coefficient among the financial barrier categories is for uninsured children in families with moderate-to-high incomes. These children had significantly lower health care expenditures than privately insured children in the same income group. There was an additional significant, positive income effect on total expenditures among children with outpatient illness-related care.

Among infants, the coefficients for children in both Medicaid categories and privately insured children in low-income families were significant. They show that insured infants from low-income families had significantly lower total health care expenditures compared to infants in moderate-to-high-income families in 1987. Furthermore, the coefficient for privately covered infants shows a greater negative effect than that for publicly covered infants. At the same time, health care expenditures for uninsured infants, regardless of family income, were not significantly different than expenditures for privately insured children in moderate-to-high-income families.

As expected, children's medical needs as reflected in variables such as age and bed disability days were significant in determining the level of health care expenditures. Total expenditures decreased at a decreasing rate as age increased for children with preventive/dental

TABLE IV-3

OLS REGRESSION ANALYSIS OF TOTAL HEALTH CARE EXPENDITURES FOR CHILDREN BY LEVEL OF CARE, 1987 NMES

	Children Aged One through 20 Years						Infants	
	Preventive/Dental Only		Illness-related Outpatient		Illness-related Inpatient			
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Intercept	4.275	8.06**	4.929	32.26**	8.608	17.15**	7.803	15.30**
Age	-0.278	-4.22**	-0.061	-2.34#	0.080	1.05	--	--
Age squared	0.014	4.12**	0.004	3.41**	-0.003	-0.73	--	--
Gender (v. female)								
Male	-0.176	-0.89	-0.006	-0.12	-0.148	-0.83	0.113	0.74
Race/ethnicity (v. other)								
Hispanic	-0.373	-1.36	-0.276	-3.34*	-0.687	-2.38#	-0.208	-0.63
African-American	-0.109	-0.50	-0.214	-3.05*	0.279	1.21	-0.343	-1.24
Health status								
No. of bed disability days	0.001	0.01	0.041	9.06**	0.013	1.25	0.013	2.07#
Pregnant in 1987 (v. not)	--	--	-0.188	-0.50	-0.632	-1.80	--	--
Dental care (vs no dental care)	1.130	6.69**	0.605	11.24**	-0.080	-0.45	--	--
Preventive care (v. no preventive care)	--	--	0.479	8.05**	-0.022	-0.10	-0.318	-1.15
SSI disabled (v. not SSI)	-1.981	3.13*	0.346	0.88	0.414	0.93	--	--
Family income/FPL	0.043	1.06	0.031	2.90*	-0.023	-0.73	-0.064	-1.54
Financial Barriers (v. private ins., ≥ 200% FPL)								
Medicaid alone	0.072	0.21	0.126	1.26	-0.023	0.07	-0.881	-2.85*
Medicaid and other insurance	-0.082	-0.16	-0.180	-1.21	0.071	0.25	-0.868	-2.38*
Uninsured, < 200% FPL	-0.559	-1.91	-0.092	-0.78	-0.123	-0.35	-0.631	-1.41
Uninsured, ≥ 200% FPL	-0.348	-0.80	-0.453	-3.43**	-0.948	-2.27#	0.213	0.71
Private ins., < 200% FPL	-0.013	-0.05	-0.008	-0.11	-0.331	-1.20	-1.466	-4.70**
Mother's characteristics								
Married (v. not married)	0.705	3.00*	-0.020	-0.32	0.148	0.57	-0.326	-1.27
< 21 years (v. 21+ years)	0.519	1.12	-0.081	-0.20	-0.105	0.28	-0.086	-0.34
Employed (v. unemployed)	0.085	0.44	0.028	0.53	-0.285	-2.05#	0.023	0.19

TABLE IV-3 (continued)

	Children Aged One through 20 Years						Infants	
	Preventive/Dental Only		Illness-related Outpatient		Illness-related Inpatient			
	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic	Beta	t-statistic
Mother's Education (v. some college)								
Less than high school	0.369	1.35	-0.147	-1.79	-0.010	-0.04	0.857	1.56
High school graduate	0.436	2.24#	-0.111	-2.08#	-0.032	-0.13	0.244	1.56
Mother lives with mother (v. lives in other houshold)	0.563	1.28	0.172	1.53	-0.237	-0.53	-0.234	-0.87
No mother in household (v. mother present)	0.391	0.63	0.013	0.10	-0.322	-0.99	-0.126	-0.21
No. of children < 6 yrs	-0.314	-2.45#	-0.128	-3.17*	-0.045	-0.30	-0.099	-0.96
Metropolitan residence (v. non-metro)								
Core metropolitan area	0.063	0.29	0.202	2.99*	0.180	0.55	0.191	0.84
Other metropolitan area	0.011	0.05	0.216	3.36*	0.012	0.05	0.123	0.56
Region (v. West)								
Northeast	-0.086	-0.27	-0.050	-0.67	-0.362	-1.52	0.198	0.89
Midwest	-0.289	-1.04	0.034	0.47	-0.383	-1.27	0.016	0.07
South	-0.456	-1.76	-0.026	-0.38	-0.505	-1.85	0.225	0.90
Sample size	221		3,423		166		244	
R-square	0.394		0.178		0.189		0.192	

** p-value ≤ 0.001
* p-value ≤ 0.01
# p-value ≤ 0.05

FPL - Federal poverty level

care only and illness-related outpatient care. Age was not significant in the expenditure equation for children with inpatient care. The number of bed disability days was significant only in the equation for children in the illness-related outpatient care category; expenditures were higher for children with more bed disability days. Children who were SSI recipients and had only preventive/dental care during the year had lower total expenditures than nonrecipients with only preventive/dental care. This finding is consistent with findings from claims data (MEDSTAT. 1995).

Preventive and dental care was complementary to illness-related care among children with outpatient illness-related care only. Thus, preventive and dental care expenditures did not reduce total health care expenditures in the year in which they were incurred. Because deliveries required relatively short hospital stays, being pregnant reduced total health care expenditures for children with inpatient care, although this variable was not statistically significant at the 95 percent confidence level.

Few characteristics of children's mothers (or other caregivers) were significant in any of the three expenditure equations. Children in the preventive/dental care only category whose mothers were married had higher expenditures than children in this category whose mothers were not married. Children with only preventive/dental care expenditures also had higher expenditures if their mothers only had a high school education than if they also had some college education. The only characteristic of children's mothers that was significant in explaining variation in expenditures among children in the illness-related outpatient care category was education; the more education the higher were expenditures. For children with inpatient care, their mother's employment status was significant, with a negative effect on total expenditures.

The number of children under six years of age in the household was also a significant factor in explaining the level of expenditures among children with only preventive/dental care and children with illness-related outpatient care. The more children six years and under in the household the lower were total health care expenditures.

Finally, two additional variables - race/ethnicity and metropolitan residence - were significant in the equation for children with illness-related outpatient care. Hispanic and African-American children had lower total health care expenditures than other children, and children who lived in metropolitan areas, either core counties or otherwise, had higher total expenditures than children who lived in nonmetropolitan areas. Hispanic children with inpatient care also had lower total health care expenditures compared to children of other race/ethnicities.

D. Discussion and Conclusions

In this chapter, we investigated health care expenditures for children using the 1987 NMES and a multiple-equation model of health care demand. In particular, we explored whether expenditures among Medicaid children differed from privately insured and uninsured children in different level-of-care categories and whether the influence of family characteristics differed in these categories.

We found that, except for infants, differences in the level of care or expenditures between Medicaid children and privately insured children in moderate-to-high-income families in 1987 were explained by differences in health status and enabling and predisposing factors. Furthermore, uninsured children were significantly less likely to have any health care expenditures and, when they did, they had significantly lower total expenditures than privately insured children in families with moderate-to-high incomes. These findings persisted after controlling for health status and selected enabling and predisposing factors.

On the other hand, Medicaid coverage but not the lack of insurance was a significant, negative determinant of total health care expenditures for infants. Infants from low-income families, regardless of insurance coverage, had lower total expenditures compared to infants from higher income families. Holding health status and other factors constant, low-income infants with private coverage had the lowest total health care expenditures compared to all other children.

Besides the financial barrier variables, the most consistent factors reducing health care use and expenditures among children in 1987 were African-American race/ethnicity, low maternal education, and the presence of siblings under six years of age. Among children with health care expenditures, the regressors in our equations explained a larger portion of the variation in expenditures for preventive/dental care only than variation in expenditures for the illness-related care.

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APPENDIX

SPECIFICATIONS FOR PREVENTIVE CARE PARTICIPATION AND VISIT RATES

To assess the extent to which children received any well-child visits and the extent to which they were compliant with the American Academy of Pediatrics (AAP) recommended periodicity schedule for well-child visits, we computed participation and visit rates for different child subpopulations. Participation rates are the percentages of children with at least one visit among those recommended (expected) to have had at least one visit. Visit rates are the percentages of total recommended (expected) visits children actually had.

To compute these rates, we assigned two weights to each child in the database. The participation weight ($\overline{P}$) reflects the child's expected probability of having a well-child visit during the year while the visit weight ($\overline{S}$) reflects the child's expected number of visits during the analysis year. The participation weight is equal to one if the expected number of visits for the child is greater than or equal to one; otherwise, the child's participation weight is equal to his/her visit weight:

$$If \quad \overline{S}_{ij} \geq 1 \quad then \quad \overline{P}_{ij} = 1;$$

$$else \qquad \overline{P}_{ij} = \overline{S}_{ij}$$

for the ith child in the jth age group. We determined the recommended number of screening visits for a child during the analysis the year based on the AAP periodicity schedule and the age of the child at the end of the year, as shown in Table 1. (Note that both the participation and visit weights can be fractions.)

For Medicaid children, we computed two sets of rates - one for the full year and one for their Medicaid enrollment period. For the Medicaid-enrollment-period rates, we adjusted for duration of enrollment by multiplying the number of recommended visits by the fraction of the year that the child was enrolled in Medicaid, or if the child was less than 12 months of age, the fraction of the child's life during which s/he was enrolled. This methodology assumes that a child was equally likely to have a visit during a month in which s/he was enrolled as during a month in which s/he was not enrolled. Thus, the expected number of visits covered by Medicaid, $\overline{S}_{Mij}$, for the ith child in the jth age group for age groups under 12 months is:

$$\overline{S}_{Mij} = \frac{Months\ Enrolled_{ij}}{Months\ of\ Life_{ij}} \times No.\ of\ Recommended\ Visits_{j}$$

and for the ith child in the jth age group for age groups 12 months or greater is:

$$\bar{S}_{Mij} = \frac{Months\ Enrolled_{ij}}{12} \times No.\ of\ Recommended\ Visits_{j}$$

We then computed a Medicaid participation weight based on the Medicaid visit weight:

$$If\ \bar{S}_{Mij} \geq 1\ \ then\ \ \bar{P}_{Mij} = 1;$$

$$else\qquad \bar{P}_{Mij} = \bar{S}_{Mij}$$

These two sets of participation and visit weights were used to compute participation and visit rates for children in different age groups. The numerator for the participation rate is the count of individuals with any well-child visits during the year (i.e., $P_{ij} = 1$ for children with at least one visit and zero for children with no visits). The denominator is the total expected number of participants, computed by summing the participation weights over the child population being tabulated.

$$Participation\ Rate = \frac{Actual\ No.\ of\ Participants}{Expected\ No.\ of\ Participants} \times 100 = \frac{\sum_j \sum_i P_{ij}}{\sum_j \sum_i \bar{P}_{ij}} \times 100$$

Similarly, the numerator of the visit rate is the total number of well-child visits children had during the year (i.e., S_{ij}). The denominator is the total expected number of visits, computed by summing children's visit weights.

$$Visit\ Rate = \frac{Actual\ No.\ of\ Visits}{Expected\ No.\ of\ Visits} \times 100 = \frac{\sum_j \sum_i S_{ij}}{\sum_j \sum_i \bar{S}_{ij}} \times 100$$

For the Medicaid-enrolllment-period rates, we counted only Medicaid covered visits (P_{Mij} and S_{mij}) in the numerators and used $\bar{P}_{Mij}$ and $\bar{S}_{Mij}$ in the demoninators.

TABLE A-1

NUMBER OF RECOMMENDED WELL-CHILD VISITS BY AGE DERIVED FROM THE AMERICAN ACADEMY OF PEDIATRICS PERIODICITY SCHEDULE

Age at End of Year	Number of Recommended Well-Child Visits in the Previous 12 Months, S_{ij}
0 months	0
1 month	1
2-3 months	2
4-5 months	3
6-8 months	4
9-11 months	5
12 months	6
13 months	5
14 months	4
15 months	5
16-17 months	4
18-20 months	4
21-26 months	3
27-29 months	2
30 months	1
31 months - 6 years	1
7 - 20 years	0.5*

* One well-child visit is recommended every other year for children aged 7 to 20 years.